the OIL AND GAS
JOURNAL
APRIL 7, 1958

Texas Takes Brunt of Cutback p. 103

Spindletop—Again the Wildcatter's Darling p. 106

How to Evaluate an Oil Field p. 230

API Crude and Products
PIPELINE
REPORT
Starts page 124

- What Happened at New Orleans
- Unattended Turbine Stations
- Greater Rewards from LACT
- How Dispatchers Can Cut Costs

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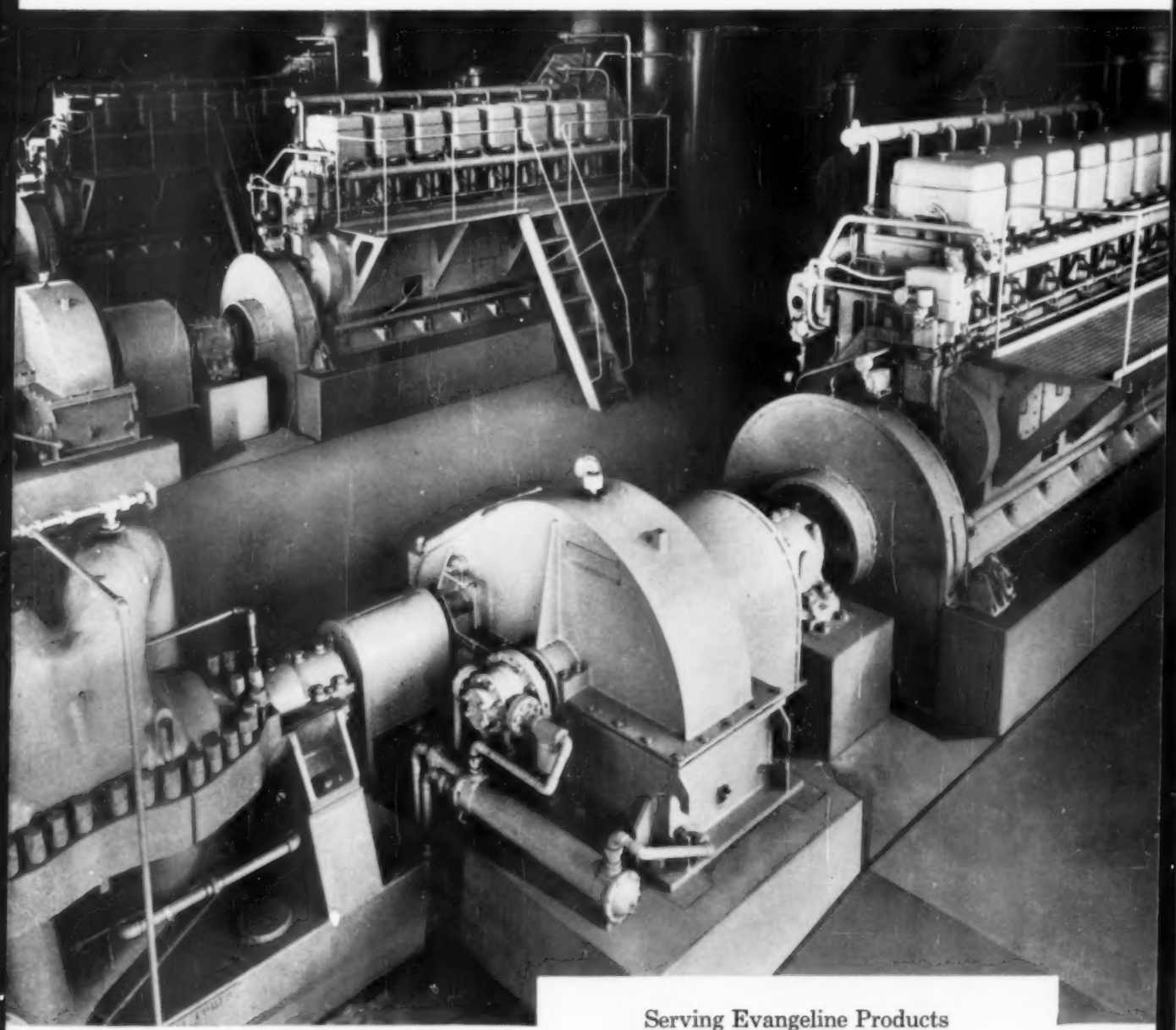
NORDBERG ENGINES FOR PIPE LINES



Serving Evangeline Products Pipe Line System satellite stations

Unattended operation and remote control of six Nordberg engine-pumping units is the feature of the Evangeline Products System's expansion. Nordberg 1720 hp, four-cycle *Supairthermal*® 8-cylinder engines are installed in two identical, full satellite pumping stations on this 16-inch products pipe line.

NORDBERG MFG. CO., Milwaukee 1, Wisconsin

SEND FOR NEW PIPE LINE BOOKLET
Illustrating the application of Nordberg engines on crude, products and gas pipe lines, and graphically describing Nordberg's facilities and ability for producing these heavy duty prime movers.

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the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
April 7, 1958

Texas Eastern has a new wrinkle on the Little Big Inch:

It is using gas to push products along the line.

This ingenious innovation is being used to solve a problem arising from reconverting the former gas line to a products carrier.

Initial volume of products on the 20-in. line from Baytown, Tex., to Chicago and Moundsville, W. Va., was low—far below the 2,000,000 bbl. of line fill needed.

So Texas Eastern pumped the first 300,000-bbl. batch to Seymour, Ind., powered by natural gas. The products will be pumped from there to Chicago normally. The gas used to push the slug along was recovered upstream. It then moved through a crossover line to the Big Inch which is a part of the Texas Eastern gas system to New Jersey.

Method worked so well it will be followed until business picks up enough for conventional operation.

Idea for the novel plan came by accident during line cleanout work. The cleaning agent was pushed along by gas. This set engineers to wondering why the same plan wouldn't work with products.

The oil industry still looks good to many security analysts whose job it is to watch the economic health of industry closely.

New York analysts took a group look at oil the other day. Their predictions:

...An upturn is in the offing, possibly as early as June, certainly no later than August.

...Long-term outlook for oil generally is good.

Private wires of brokers also report that earnings of international oil companies won't be hurt much by the new imports restrictions. Also earnings of 14 refiners who got new quotas won't be boosted. Volumes allowed are too small to affect earnings much.

Crude price adjustments continued last week showing signs of continued weakness in the market.

Magnolia cut the price on 16,000 bbl. of Oklahoma sweet 10 cents to a new top of $3.05; cut South Texas Seeligson crude by 15 cents to a $3.20 top; and trimmed 7 cents off

the price in North Texas and Scurry County, West Texas, with new tops of $3.08 in both areas.

Shell reduced postings 15 cents for Illinois basin oil and 10 cents for southern Oklahoma sour crude.

Atlantic Refining cut price in six Southwest Texas fields by 10 cents and in four by 15 cents; cut Refugio heavy in six fields by 15 cents and Refugio light in 13 fields by 20 cents; and reduced condensate by 15 cents.

Indiana Oil Purchasing scaled down high-gravity oil 2 cents a degree starting at 45 degrees. The new scale is effective in parts of New Mexico, North, West Central, and West Texas. High Island pool of the Texas Gulf Coast also took an 18-cent cut.

Look for a battle to erupt in Congress after Easter over imports.

New voluntary imports control move apparently pleases no one in Washington. The fight in Congress now will center on the Ikard bill. It calls for competitive bidding for imports licenses, plus strict quotas on imports of both crude and products (p. 101).

Magnolia researchers have come up with two promising developments: A new inverted emulsion cement and a system that uses television to help filter static from seismograms.

The cement suspends water in diesel oil. When cement is added, the slurry remains in the oil phase. Down hole, higher temperature slowly breaks the emulsion. The cement contacts water, and the mixture hydrates.

Magnolia says the new cement should be helpful in zones containing clay. Water in conventional cement causes clays to swell and seal off pore space.

Use of television to get clearer seismograms works like this: Field seismograph tapes are run through a central play-back facility. Signals pass through electronic filtering circuits to a TV monitor and are rerecorded on paper. Operator at TV screen filters out static by adjusting dials, and the resulting seismogram is much easier and faster to read (p. 114).

The Golden Lane in Lake Maracaibo has two more good hits.

Sun Group has completed a pair of producers in Block 1.

SVS-7, completed in Icotea horizon, tested at rate of 3,240 bbl. daily of 33.9°-gravity oil through ½-in. choke.

SVS-8, completed in Eocene sands, tested at rate of 6,350 bbl. daily of 35.2°-gravity oil through ¾-in. choke.

The group has several other good producers in the block which lies in the path of one of the best new production trends in the lake. (OGJ, March 3, p. 66).

Drilling sidebars: First offshore well on U. S. side of Lake Erie will start this spring. New York State Natural Gas

Corp. is assembling special platform to test its 35,710-acre concession...Drilling activity of Humble will be cut about one-third this year. Company's drilling costs jumped $18 million last year while completions dropped by 38 wells. Dry-hole costs represent 42 per cent of company's total drilling expenditures...The Spindletop area is proving happy hunting grounds for today's wildcatters 50 years after that gusher blew in. Within a 30-mile radius of Spindletop six discoveries this year have climaxed a wave of current development.

A 5-year-old water-flood project in Oklahoma has proved one thing: Tight, shaly sands will respond to flooding.

Gulf's smooth-running project, the Deep Fork Unit in Creek County, has boosted production from 28 bbl. daily from 29 wells to 1,200 bbl. daily from 36 producing wells. The field itself is nearly 40 years old (p. 168).

The old christmas tree has a new look.

Equipment with a new unitized design is being offered by Oil Center Tool Co. It's a single forged-steel piece to serve as body for all master valves, crown valves, and wing valves.

Resulting tree is only one-third as tall, weighs only half as much, and costs less than conventional trees.

Automatic custody transfer is growing so fast that a substantial share of U. S. production will be handled automatically within a few years.

By July there will be 99 LACT installations delivering 170,000 bbl. daily of crude.

More than half of the facilities are unattended; 91 per cent will use electrically operated controls; and 98 per cent of the meters will be temperature compensated and will use ticket printers.

Two facts now characterize LACT installations: They are widely scattered. They are used on leases having higher than average production.

But this may change as growing use of automation compels both the producer and pipeline companies to take a new look at the economics of the system (p. 133).

Contracting for pipeline maintenance is becoming widespread.

Even station operation and gaging are contracted in isolated cases.

That's the trend revealed by a special panel of pipeliners held recently in Tulsa (p. 181).

Gas for an experiment to move liquid methane overseas will come from East Moss Lake field in South Louisiana.

Constock Liquid Methane Corp. revealed its source of

supply in detailing plans to the FPC. However, if the big test is a success and regular service is started, a long-term gas supply will be secured outside the U. S.

Pipeline notes: Cost cutting was the topic on everyone's lips at last week's New Orleans gathering of API Division of Transportation. It was labeled biggest current problem in the industry...First gilsonite pipeline has operated nearly a year without trouble. It has moved 170,000 tons at out-of-pocket expense of only 2.5 cents per ton-mile. Success opens great potential for this type of transport...Plans for gas pipeline expansion in Middle West have been jolted by FPC. Applications of Midwestern Gas, Natural Gas Pipeline, Michigan Wisconsin Pipe Line, and Northern Natural have been rejected. ...Technical defects in projects were given as the reasons... That super-inch pipeline from Middle East fields through Turkey to Eastern Mediterranean has been shelved. Reason: Drop in Western European demand, plus sudden tanker surplus.

Look for the products subsidiary of El Paso Natural Gas to step up its marketing activities in the Southwest this year.

A new 9,000-bbl. daily refinery will come on stream at Odessa, Tex., by mid-summer. By then the company plans to have in operation several new service stations adding to the present 250 that market in five southwestern states.

Pipeliners also will be interested in two views of El Paso Natural lawyers: They're confident the Supreme Court will reverse the Memphis case ruling of the Circuit Court and that the company will win the fight to protect its merger with Pacific Northwest.

A device to convert heat directly into electrical energy is being patented by two M.I.T. professors.

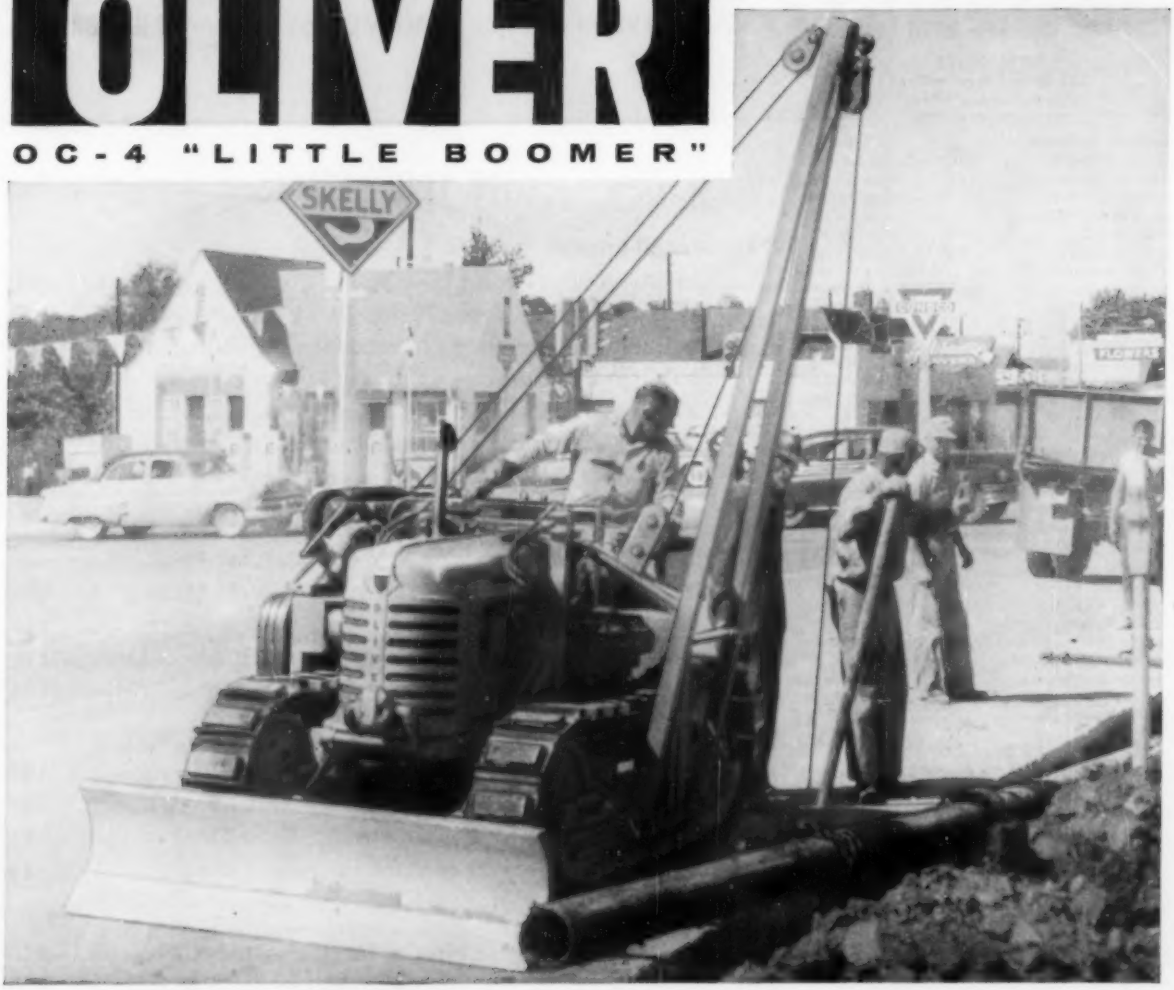
Any fuel can be used to provide necessary heat—gas, oil, coal, nuclear fuels, or solar energy. Since no moving parts are involved, thermal efficiencies of 12 per cent have been obtained and 30 per cent is expected.

The device is known as a thermoelectron engine. It is believed to be the first fuel-cell adaptation perfected in the U. S.

Company notes: California Oil Co. (Standard of California) is dropping its Calso trademark on Eastern Seaboard, plans to spend $2 million on advertising campaign to switch to its West Coast and Southwest Chevron retail symbol...Royal Dutch-Shell Group annual reports later this month will show 18 per cent profit increase for 1957. Net income of group was $595.5 million...British American is one of the early birds with first-quarter 1958 reports. It says product sales are running higher than last year but earnings are off due to squeeze in profit margin.

OLIVER

OC-4 "LITTLE BOOMER"



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TECHNOLOGY—OPERATION

Pipelining

Unattended Stations Change Middle East Pipeline Economics 125
By W. E. Locher, A. E. Olson and P. P. Nibley

Six new pumping units have just been placed in operation by Trans-Arabian Pipe Line Co. The units are driven by 5,000-hp. combustion gas turbines. The line can now move 450,000 bbl. per day of crude oil from Qaisumah, Saudi Arabia, to Sidon, Lebanon.

Greater Reward from LACT 133
By H. L. Shatto and A. H. Hall

The use of lease automatic custody transfer (LACT) equipment is growing rapidly after a rather long period of development. Many of the installations have paid off handsomely to the producers through saving the price of new tankage which would otherwise have been required. The surface has only been touched, and producers can profitably expand LACT far beyond its present use.

How Dispatchers Can Help Cut Operating Cost 140
By Fred M. Springer

They can prevent excessive power consumption by station adjustments and alertness to need for running scrapers. They can conserve manpower by proper scheduling. By knowing the system thoroughly, they can detect possible leaks and order ground or aerial patrol search.

Quarterly Costimating Report 165

New index information on pipeline construction.

On The Job . . . Pipelining: Contracting for Maintenance 181
By Gene Kinney

Here are the results of a discussion on the desirability, economics, and dependability of using contractors for pipeline maintenance. The seven panel members agree that the practice is becoming widespread.

Refining-Processing

Refinery Construction Index 147

WPRA Panel: Tips on Refining Problems 157

Part 2 of a four-part series. Here are suggestions by men who are experts in their field on how to solve problems in cat cracking, cat reforming, alkylation, and other refining problems.

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Process Costimating 170

Pay royalties or do process research?

The Foreman's Page 175

Drilling-Production

A Method for Determining Optimum Drilling Techniques—2 148
By John W. Speer

Here is a procedure which will assist the driller to arrive at near-optimum drilling techniques in the shortest possible time. The chart is as yet tentative and field testing should be continued.

Will Shaly Sands Respond to Water Flooding? 168
By Norman S. Morrisey

Gulf Oil Corp. is justly proud of its Deep Fork water flood in Creek County, Oklahoma. Here Gulf and its unit partners are entering their fifth year of water flooding the lower Skinner sand at a depth of 2,500 ft. The results have been successful. The 1,120-acre lease made 28 bbl. per day before flooding and is now making 1,100 to 1,200 bbl. of oil per day.

Modern Drilling 173

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STEAM BATH*

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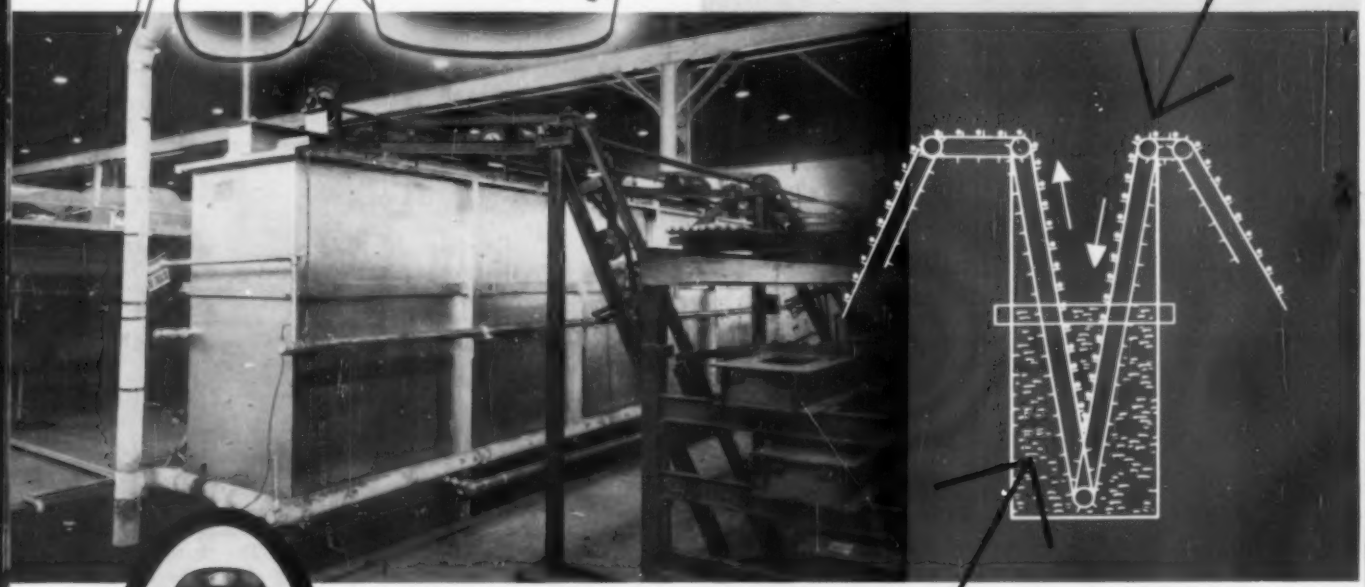

All grease, oil and foreign matter disappear in Steam Bath leaving metal bare.

Norris Rod photographed on assembly line after leaving degreaser.

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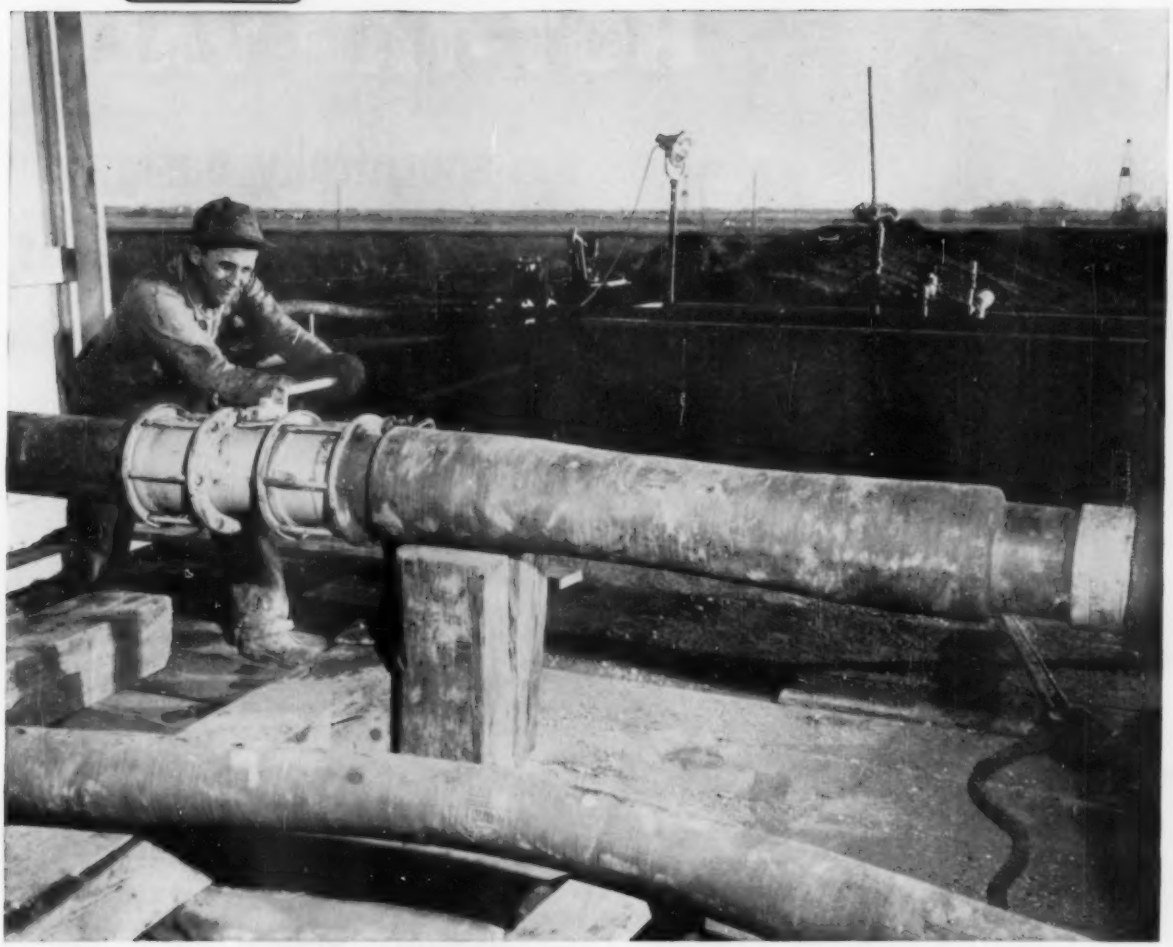

Hose soaks up vibration, increases pump life

B.F.Goodrich mud pump suction hose is built to absorb the vibrations that used to shorten pump life. To dampen these destructive vibrations, B.F.Goodrich engineers developed the most flexible hose ever built for this type of service.

Rayon cord is used for reinforcement in this B.F.Goodrich hose rather than the stiff, wrapped plies of fabric found in ordinary hose. These cords run parallel with no cross threads to tie them together, are completely surrounded by rubber. They are free to "give" and absorb the pump's shaking action. As a result, both the hose and the pump last longer. There's less down time, lower operating costs.

For protection against abrasive mud, the tube of this B.F.Goodrich hose is made of a special rubber compound that outwears steel. It is oilproof, has a smooth surface so mud flows through at high speed.

This B.F.Goodrich hose is built to take full vacuum. A spiral of heavy spring steel wire is imbedded in the hose body to prevent collapse, increase crush resistance.

You'll find B.F.Goodrich mud pump hose at leading supply stores in the oil field, or at any of these B.F. Goodrich warehouses: Los Angeles, Great Bend, New Orleans, Shreveport, Hobbs, Oklahoma City, Tulsa, Corpus Christi, Dallas, Houston, Kilgore, Odessa, Wichita Falls. *B.F.Goodrich Industrial Products Co., Dept. M-325, Akron 18, Ohio.*

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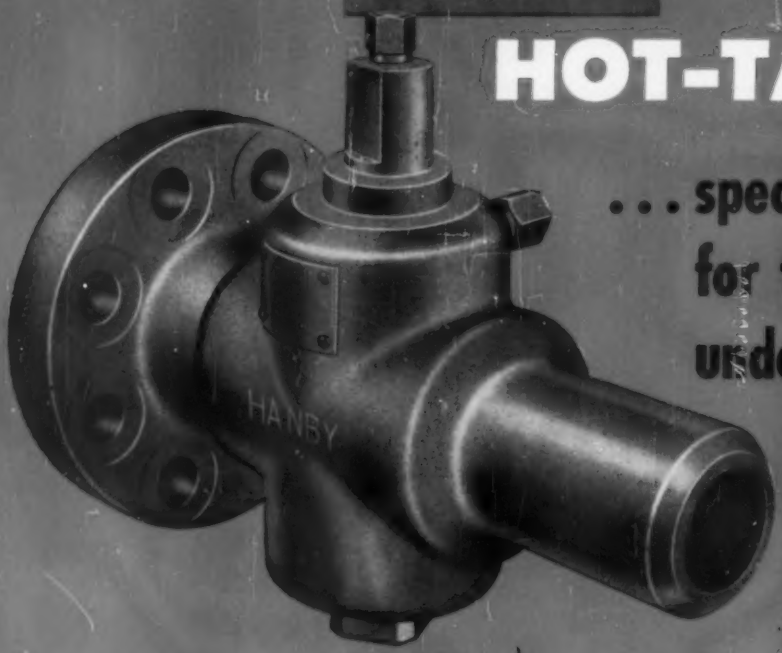

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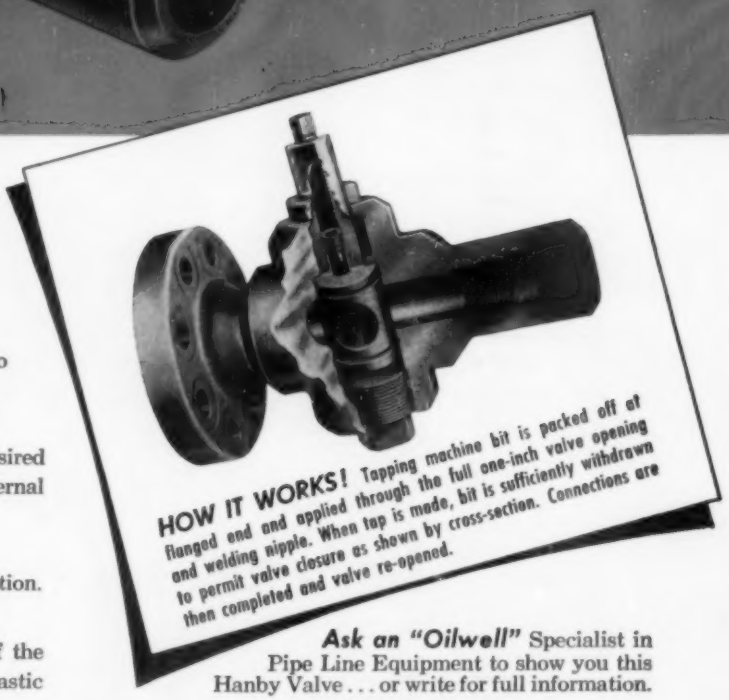
. . . to hot-tap applications, this is an excellent blow-down valve for scrubbers and drips or low places in the line. Internal threading permits the use of a 1" syphon to the bottom of the pipe.



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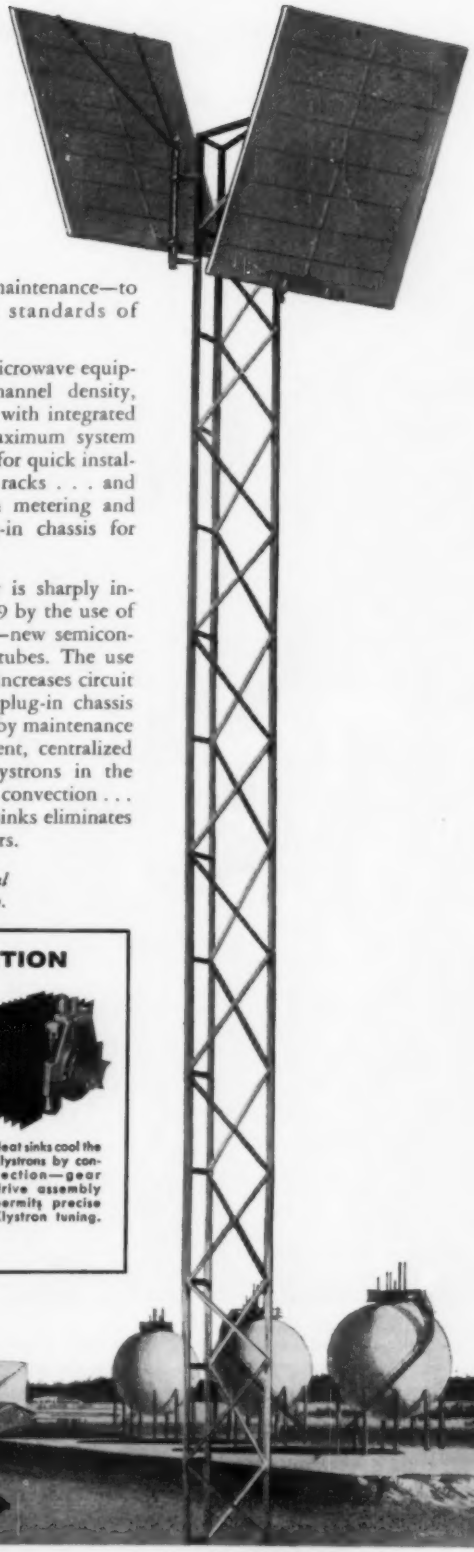

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Philco's complete turnkey service includes—*site surveys* by competent survey engineers experienced in field techniques; *system planning* by Philco's systems engineers who design your complete communications system; *installation* of your microwave system by Philco field engineers—including erection of towers and shelters; and, Philco field engineers are available for *field service*—periodic inspection and preventive maintenance—to maintain the highest standards of system performance.

Philco's new CLR-9 microwave equipment provides high channel density, duplex communications with integrated standby facilities for maximum system reliability. It is designed for quick installation in standard relay racks . . . and engineered with built-in metering and test facilities plus plug-in chassis for easy field maintenance.

Performance reliability is sharply increased in the new CLR-9 by the use of tubeless power supplies—new semiconductor rectifiers replace tubes. The use of printed wiring panels increases circuit stability—and complete plug-in chassis may be quickly removed by maintenance personnel (permits efficient, centralized depot maintenance). Klystrons in the new CLR-9 are cooled by convection . . . the use of compact heat sinks eliminates the need for bulky blowers.

At Philco, opportunities are unlimited in electronic and mechanical research and engineering • Look ahead . . . and you'll choose Philco.

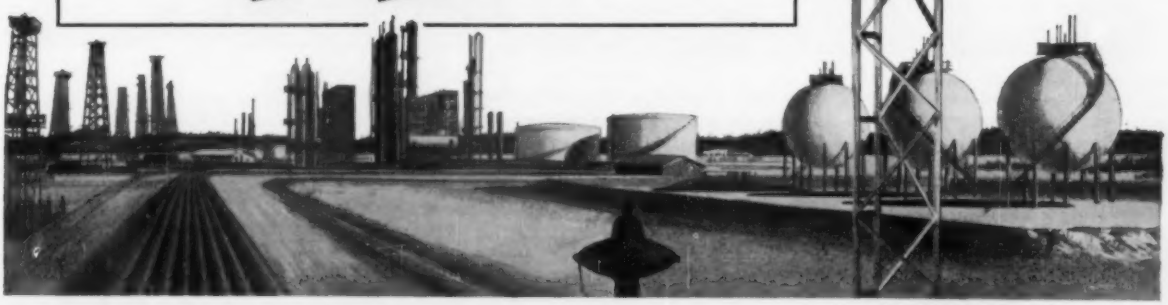
NEW PHILCO CLR-9 MICROWAVE STATION

The CLR-9 terminal consists of wave-guide assemblies, master control, tubeless power supplies and plug-in chassis for IF assembly, baseband drop, modulator, reflector control and servo.

Rugged printed wiring panels increase circuit stability and simplify maintenance.

Heavy-duty, tubeless power supplies increase reliability by employing semiconductor rectifiers—assures maximum reliability and minimum maintenance.

Heat sinks cool the Klystrons by convection—gear drive assembly permits precise Klystron tuning.



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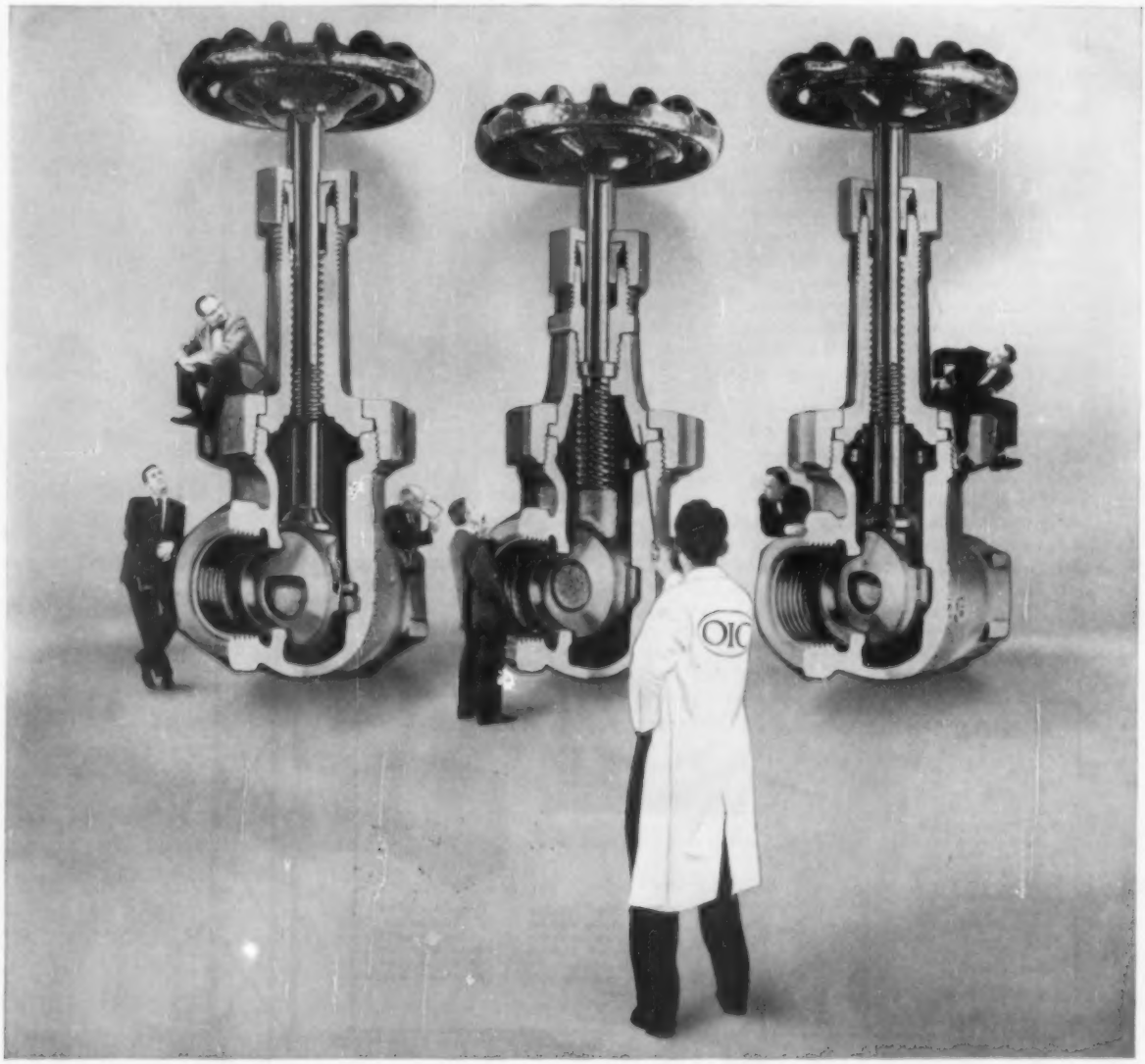
In Canada: Philco Corporation of Canada Limited, Don Mills, Ontario

...3 gate valve types in 3 pressure classes, gentlemen, all with safe, efficient (and effective) union ring joints

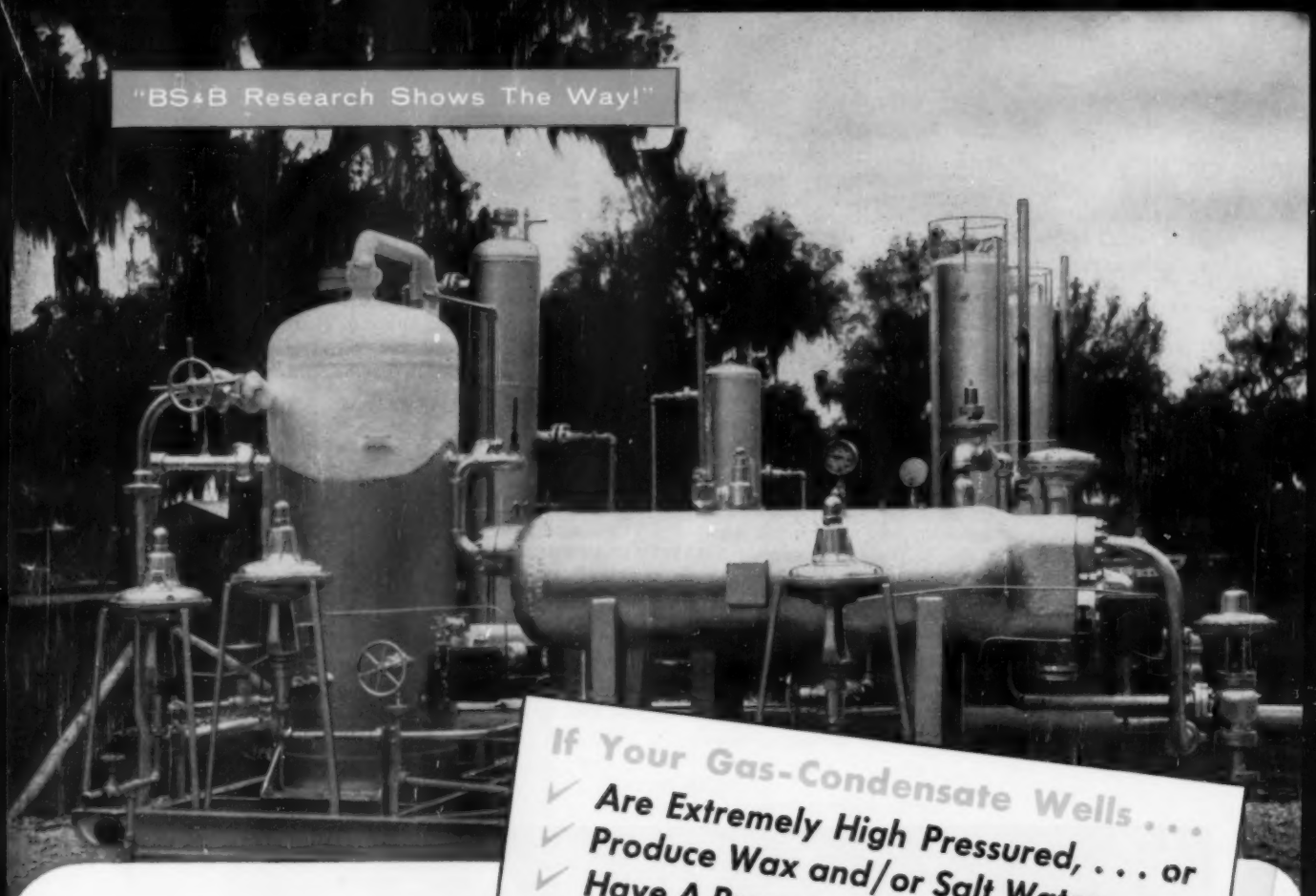


125 lb.—150 lb.—200 lb. OIC bronze gates . . . the most *modern*, complete line you'll find anywhere. Solid wedge—split wedge—rising or non-rising stems. All, of course, featuring OIC *alloy-40* stems which OUTLAST ORDINARY VALVE STEMS 10 to 1!

Call your OIC Distributor for quick service. Or write for specification literature.

THE OHIO INJECTOR COMPANY • **Wadsworth, Ohio**

OIC VALVES | BRONZE, IRON, FORGED AND CAST STEEL LUBRICATED PLUG VALVES



If Your Gas-Condensate Wells . . .

- Are Extremely High Pressured, . . . or
- Produce Wax and/or Salt Water, . . . or
- Have A Pressure Life of 3 to 5 Years . . .

You Need The BS&B COLD-FRAC®...Model MDH For Most Efficient And Profitable Production!

IF the wellhead pressure of your gas-condensate wells is 3,000 psi or more, a BS&B Model MDH COLD-FRAC System will probably give condensate recoveries comparable with other much more elaborate low temperature separation systems. Specially designed heat exchanger achieves maximum cooling with minimum pressure drop through counterflow with cold sales gas.

IF your wells are producing wax and/or salt water, a BS&B Model MDH COLD-FRAC System, with its highly efficient Model DC Liquid Knockout, will effectively remove particles 10 microns in size or larger. This inlet knockout handles the maximum rated gas capacity without carryover while handling a normal volume of liquid. Waxy oils and salt water are efficiently removed and bypassed around the heat exchanger and choke.

IF your wells have a pressure life of 3 to 5 years, a BS&B Model MDH COLD-FRAC System will normally maintain the proper balance between initial cost and added recovery. More than 60 standard sizes are available from which to select the unit best suited to your requirements.

Other Types Of BS&B COLD-FRAC Systems...

ECON-O-MAX—for economical application of low temperature separation to small gas-condensate wells.

Model GDH—(with hydrate inhibitor) for maximum condensate recovery from wells having a pressure life of more than 5 years.

Gasoline Plants—for lease location or for central gathering stations.

Ammonia Absorption Refrigeration Units—for producing and maintaining temperatures below zero from energy supplied from natural gas fuel.

See Your BS&B Salesman For Detailed Information On BS&B COLD-FRAC Systems — Or Write To . . .

EFFICIENCY OVER 60 YEARS BS&B RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.

Oilfield Equipment Division, Dept. 1-A4

P. O. Box 1714 Oklahoma City, Oklahoma

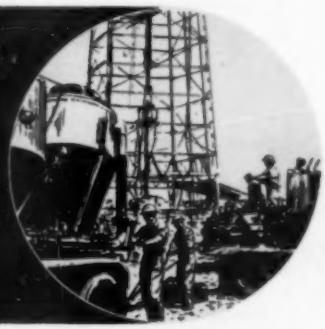
TYPE "J" TEXAS PATTERN CASING SHOE

... with open end, used in rotary drilled wells of shallow areas and shallow cable drilled wells where it is not necessary to guide or float the casing to bottom. Reinforces lower end of casing column to reduce damage to casing, aids in running-in past hole obstructions.

TYPE "L" LINER SET SHOE

... essential aid for correctly setting and cementing liners on bottom. Available with or without fluid ports. The saw-type teeth help to keep the liner from rotating while setting tool is backed off; ports allow free circulation of cement or fluid to the outside with liner resting on bottom.

HALLIBURTON'S *"well-designed"* CEMENTING TOOLS



For an unmatched combination of superior cementing tools and skilled cementing personnel... both bearing the name of the world's most experienced oil well cementing organization... specify HALLIBURTON for a better cementing job.

Because even the best tool is no better than the skill of its operator, Halliburton tools are effectively controlled by thoroughly trained and experienced Halliburton Cementers... men who know the design and purpose as well as the operation of the tools they use.

Put this profitable "work team" on your next cementing job. For "well-designed" tools and "well-experienced" cementers, the name to remember is Halliburton.

HALLIBURTON

OIL WELL CEMENTING COMPANY

Duncan, Oklahoma

These Halliburton Tools... and many others **aid in better cementing of your well**

SELF-FILL DIFFERENTIAL COLLAR

HALLIBURTON'S SELF-FILL DIFFERENTIAL COLLAR

Designed expressly for use with Halliburton Super Seal Floating Equipment, the Self-Fill Differential Collar is engineered to fill casing automatically, with greater speed and safety as it is run into your well. Only one fill-up collar is required for each casing string, regardless of depth.

Placed above the uppermost Super Seal Float Valve, the Self-Fill Differential Collar offers these important advantages:

- Running-in time greatly reduced, saving costly rig-time.
- Helps to eliminate dangerous low pressure areas which often promote blowouts.
- Unlike most other fill-up devices... downward flow of fluid is not restricted when casing is raised.
- Better control over blowout dangers... low differential pressure between annulus and inside of casing maintained by the spring-loaded valve.
- Plugging reduced... casing is filled from side-ports above end of casing where mud is cleaner.
- Circulation may be established downhole without tripping valves.
- Faster, easier flushing of cuttings and settlings from float valves on each pickup of casing string.

SUPER SEAL FLOAT COLLAR

SUPER SEAL FLOAT SHOE

HALLIBURTON'S SUPER SEAL FLOATING EQUIPMENT

The Float Shoe and Float Collar equipped with the positive acting Super Seal Valve gives extra protection while running, landing, and cementing casing in a well. Provides more than twice the sealing area of usual ball and seat valves for positive shut-off against back pressure below. Special concrete formula gives superior shock resistance and guiding efficiency.

HALLIBURTON'S CEMENT GUIDE SHOE

The landing of the first joints of casing on bottom to be cemented may be hazardous. Safety is increased by installing a Cement Guide Shoe on the first joint. The strong, durable, rounded Guide directs the casing away from ledges to reduce side-wall caving, safely passes through crooked holes, and penetrates temporary bridges.

TURBO-JET FLOAT SHOE

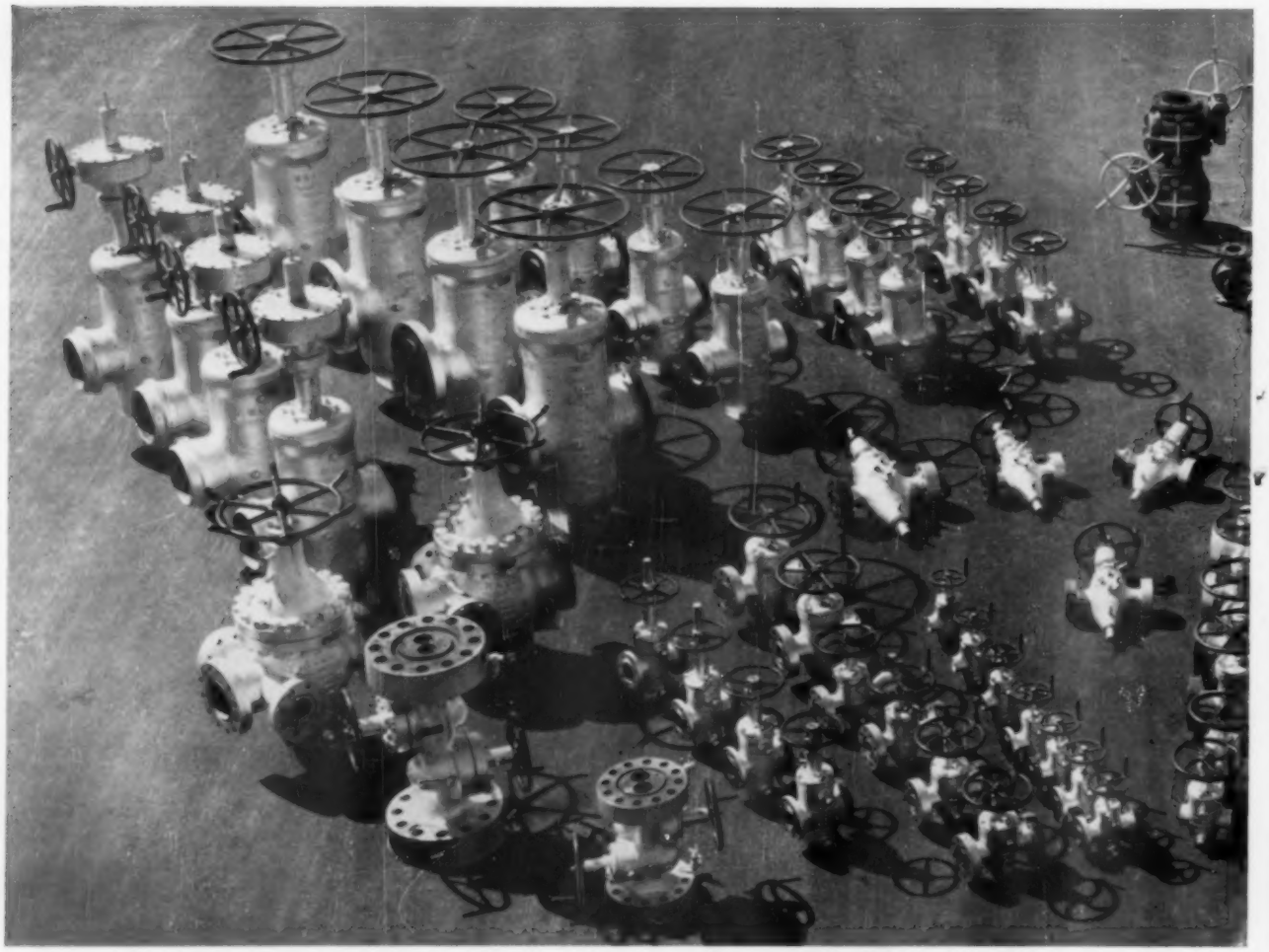
HALLIBURTON'S TURBO-JET FLOAT SHOE

Engineered to float and guide casing strings to bottom, this tool also helps to agitate and distribute cement outside the casing to minimize channeling. Built-in rotor forces powerful jet-stream of fluid through side ports and bottom to agitate cement for more uniform cementing around casing. All parts are drillable.

CEMENT GUIDE SHOE

CEMENTING SERVICES

"A Well Worth Cementing Is Worth Cementing Well"



VALVES BY W-K-M... for every Oil

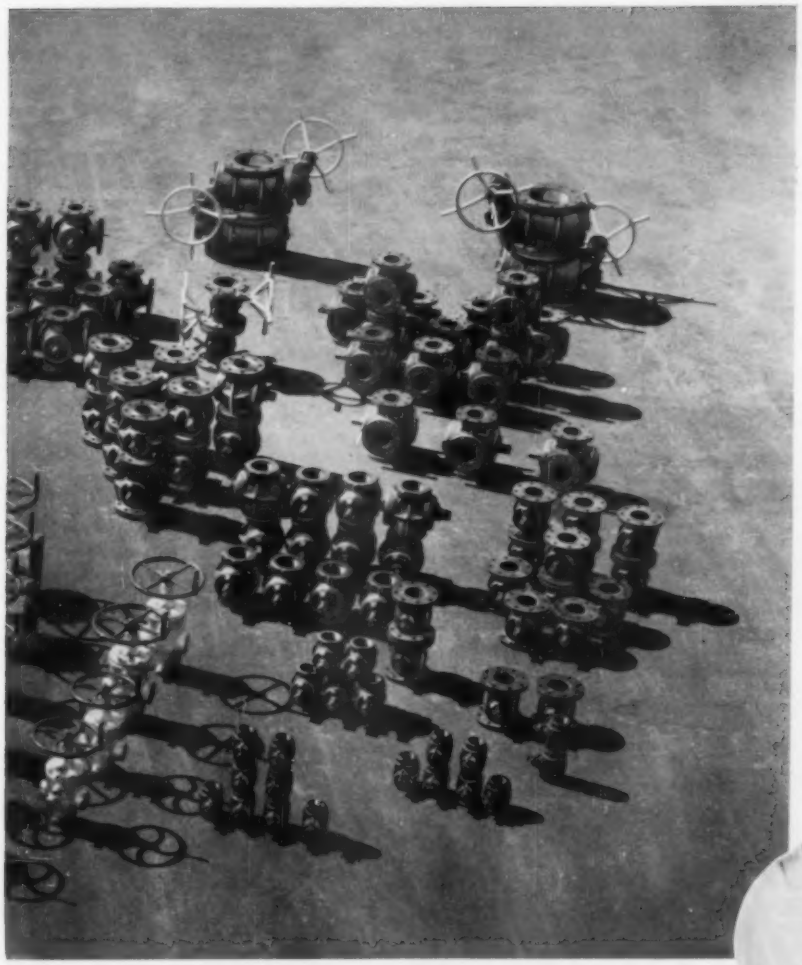
Our complete line of valves means you can specify "Valves by W-K-M" for every oil industry service and be assured of unmatched valve performance in every application.

Three basic types — W-K-M Through-Conduit Gate Valves, acf Lubricated Plug Valves and acf Non-Lubricated Ball Valves are available in 31 styles and more than 500 size and pressure combinations. Considering the different types of end connections, operators, body materials and trims available, the number of valves from which to make your selection reaches into the thousands.

W-K-M THROUGH-CONDUIT GATE VALVES feature parallel expanding gates for controlled force seating. Teflon* seat inserts provide double-tight sealing, upstream and downstream. They are available in both API and ASA ratings for drilling, production, pipeline, and process installations.

acf LUBRICATED PLUG VALVES with cylindrical plugs, provide full volume flow through either the round or rectangular ports. Their efficient lubrication system and the Teflon head gasket, assure positive sealing, easier turning, and maximum protection against wear and corrosion.

acf NON-LUBRICATED BALL VALVES have positive, leakproof, two-way sealing-seating rings. The stem is efficiently sealed with two Teflon gaskets. There are no metal-to-metal moving surfaces to wear or gall. They are available in full pipe area round port and reduced port types.



Industry Service

FOR YOUR VALVE DATA FILE

Selecting the valve that is best for your service is easier and faster with these W-K-M Catalogs at your fingertips. Write Dept. A 4-07 for your copies today.

W-K-M ASA Through-Conduit Gate Valves, Catalog 300
W-K-M Gate Valves for Oil Field Services, Catalog 200
acf Semi-Steel Lubricated Plug Valves, Catalog 400
acf Carbon Steel Lubricated Plug Valves, Catalog 1100
acf Non-Lubricated Ball Valves, Catalog 1000

W-K-M
DIVISION OF acf INDUSTRIES INCORPORATED

PLANT: MISSOURI CITY, TEXAS
MAILING ADDRESS: P. O. BOX 2117, HOUSTON, TEXAS

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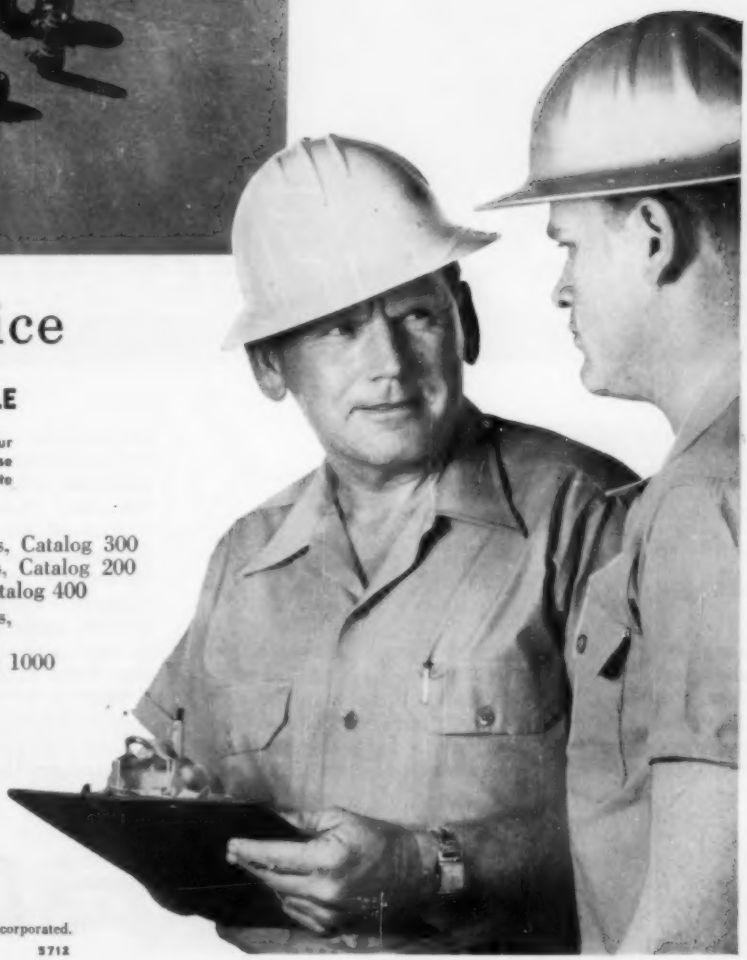
*DUPONT TETRAFLUOROETHYLENE RESIN.

5712



Here's the new sweetheart of the Task·Force fleet, Chevrolet's new Fleetside pickup! No truck has ever been better to look at . . . or better for your business.

Long, sweeping lines, graceful body contours . . . *new* truck appearance that's fleet, dashing and completely modern! Yet there's even more to the new Chevrolet Fleetside than the striking beauty that first meets your eye. There's *size*, for instance: extra room inside to pack many additional cubic feet of payload. In lengths of either 78 inches or 98* inches and a full six feet in width, this new body actually provides 50% more cubic capacity than the conventional pickup box!

And with an extra-sturdy build—the result of features like double-walled lower side panels, durable hardwood floor and solidly constructed full-width tailgate—the new Fleetside is the toughest of pickup bodies, made to stand up under a steady pounding. A new adjustable latch keeps graintight tailgate free from rattles.

Here's a new high in hard-working utility matched by styling that stands out on any street and speaks volumes about both you and your business. See and try the latest in pickups, the new Chevrolet

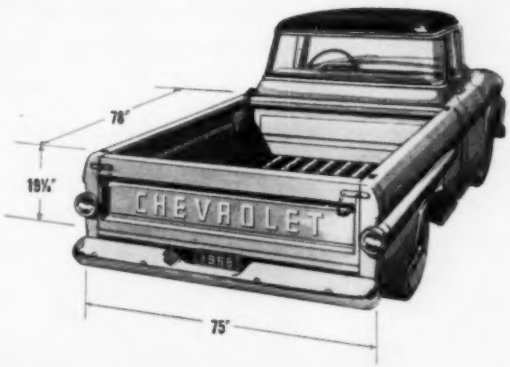
CHEVROLET **CHEVROLET**

BY CHEVROLET

Fleetside, at your Chevrolet dealer's now! . . . Chevrolet Division of General Motors, Detroit 2, Michigan. **Optional at extra cost.*

More load space than any other comparable low-priced pickup. Up to 75.6 cubic feet of load space to pack bigger cargoes and help you get more done each day. The new Fleetside body is so wide you can haul standard 4′ x 8′ sheets of building material and still have room along the sides for extra items of payload!

Plenty of work-whipping hustle and muscle. Your choice of two great engines that know how to save—standard 145-h.p. Thriftmaster 6 or optional at extra cost 160-h.p. Trademaster V8. And Fleetside chassis components are truck-engineered down to the last bolt; they'll take all the abuse your most bruising hauls can give them!



TASK · FORCE TRUCKS

it's New... WEATHERFORD OIL TOOL now offers a new CASING RECOVERY METHOD..

This new casing recovery method . . . an engineered service . . . enables the operator to economically recover the uncemented portion of the casing when the well is abandoned.

PUTS OPERATING DOLLARS BACK IN YOUR POCKET.

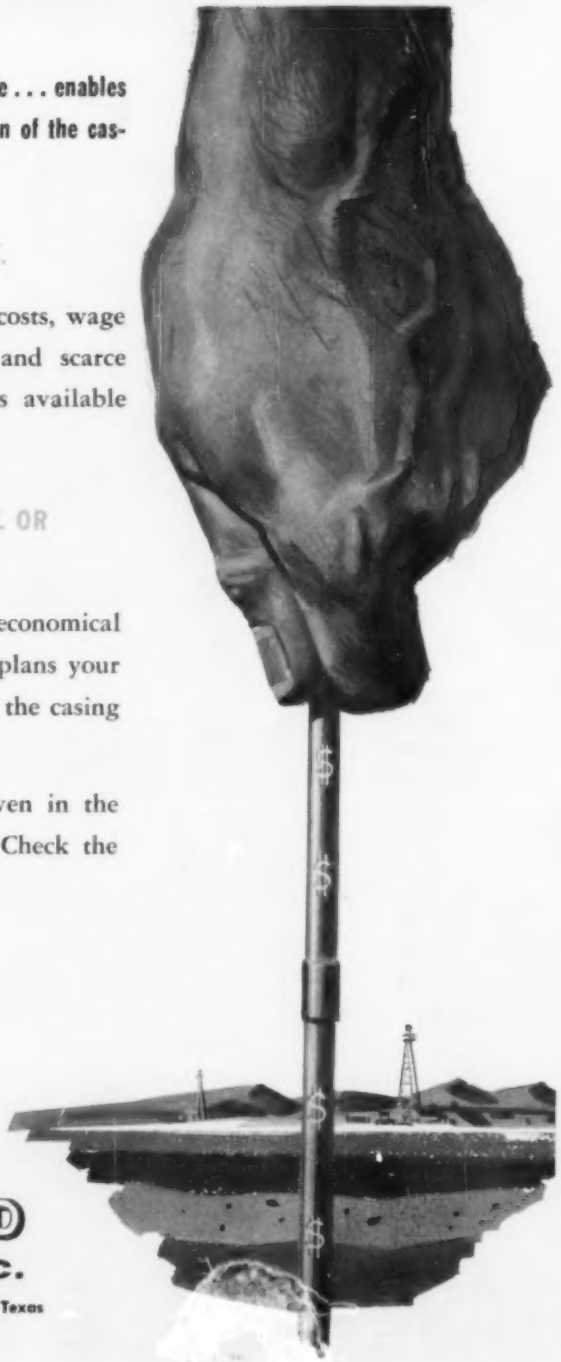
In the face of increased operating and equipment costs, wage hikes, rising steel costs, fewer producing days and scarce dollars, recovered casing will mean more dollars available to help maintain a delicate profit balance.

RECOVER CASING IN MARGINAL, NON-COMMERCIAL OR DRY HOLES.

This engineered casing program will allow the economical recovery of the uncemented portion. Weatherford plans your casing recovery program *before* you set pipe. Then the casing can be recovered when the need arises.

The Weatherford method of casing recovery, proven in the field, can now be engineered for your next well. Check the yellow pages for the Weatherford phone number.

More of your casing dollars can be economically recovered when you rely on the Weatherford Engineered Method.



WEATHERFORD OIL TOOL CO., INC.

GENERAL OFFICES: 5920 Navigation Blvd., Houston, Texas

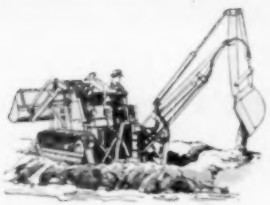
The Tractors That Industry Drafted...

The NEW JOHN DEERE "440's"

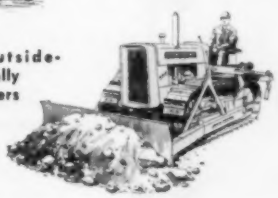
The highly mobile new "440" Wheel Tractor is ideal for construction and maintenance work of all types.

Ruggedness, power, operator's comfort, and all-around economy are featured in the new "440" Crawler.

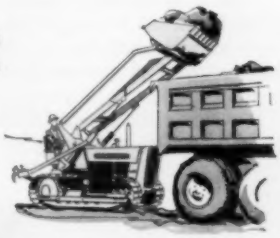
A new, complete line of John Deere quality-built working equipment matches the "440's" to the construction job.



Deep-digging, highly efficient backhoes . . . power-operated trenching units . . . and fast working scrapers are available for both crawler and wheel models.



Inside- and outside-mounted, hydraulically controlled bulldozers team up with the high-torque John Deere Crawler to handle a wide variety of work.



Heavy-duty front-end loaders with rear-end scarifiers make fast work of earth moving. Exclusive clutch-type direction reverser saves time, effort on many jobs.

Your John Deere industrial dealer can tell you of the many other types of equipment available for use with John Deere Industrial Tractors.

THE new John Deere Crawler and Wheel Tractors are just what industry ordered—big-capacity power at low cost—low in initial cost and in operating cost.

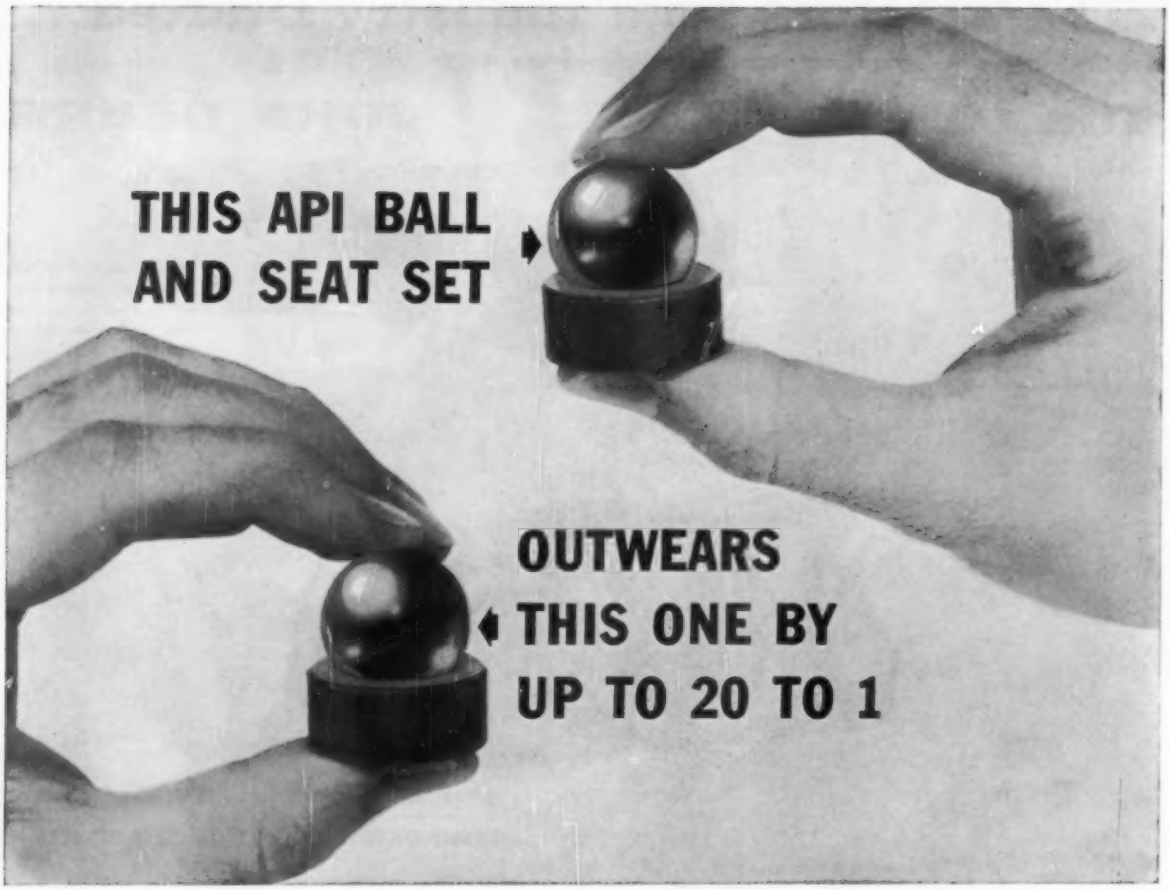
Both John Deere Tractors are ruggedly built from grille to drawbar . . . designed, inside and out, to fill definite needs in industrial work of all types . . . to cut costs to rock bottom on every job you assign them. Both tractors are built around the amazingly efficient John Deere engine, unmatched for delivering so much for so long for so little. Both are ruggedly constructed and boast many features, including optional clutch-type direction reverser, that enable them to do more than their share of the day's work. Power steering on wheel type is available if desired.

Let your John Deere industrial dealer fill you in on the many qualities of design and construction that make these tractors so suitable for the rough, tough everyday jobs of modern industry.

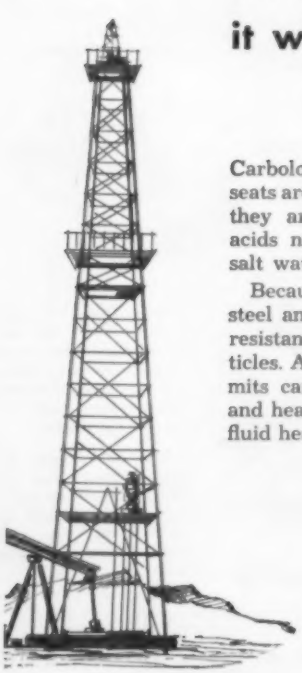
JOHN DEERE Industrial Tractors and Equipment

Completely Engineered for Industry

For Further Information Write: **JOHN DEERE INDUSTRIAL DIVISION • MOLINE, ILLINOIS**



It's Carboloy® cemented carbide . . . and here's why it withstands the sand, sulfur, acid and impact that quickly ruin even hardened stainless steel



Carboloy cemented carbide API balls and seats are ideal for sub-surface pumps because they are practically inert to corrosion by acids normally found in oil and gas. Even salt water does not measurably affect them.

Because carbide is harder than the hardest steel and takes a high polish, it is far more resistant to abrasion by sand and other particles. And its greater impact resistance permits carbide to withstand severe pounding and heavy loads caused by the weight of the fluid head.

Carboloy cemented carbide balls and seats outwear even hardened stainless steel by up to 20 to 1. Because they stay on the job longer, you can reduce pulling and service costs . . . maintain continuous production.

When ordering from your supplier, be sure to specify Carboloy balls and seats. They're available for immediate delivery in standard API sizes. For more facts, write: *Metallurgical Products Department of General Electric Company, 11181 E. 8 Mile Street, Detroit 32, Michigan.*

CARBOLOY®
CEMENTED CARBIDES
GENERAL ELECTRIC

Adding up the reasons brings you right to COLUMBIA-SOUTHERN SODA ASH

3 plants at Barberton, Ohio... Corpus Christi, Texas... and very soon Bartlett, California, too... assure you prompt deliveries dovetailed to your production schedules. Water shipment is available from Corpus Christi, for customers who can advantageously accept.

2 processes give you important added choices in selecting the product best suited to your particular needs. Ammonia Soda process soda ash is available from Barberton and Corpus Christi, while the new Bartlett plant offers soda ash made from a natural soda source with abundant reserves.

1 quality to meet any customer specification, consistent with the highest standards of the industry.

14 sources for experienced, creative service and assistance are just as near as your telephone. Contact any of the fourteen Columbia-Southern District Sales Offices for prompt and helpful information.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION — A Subsidiary of Pittsburgh Plate Glass Company

One Gateway Center, Pittsburgh 22, Pennsylvania • DISTRICT OFFICES: Cincinnati • Charlotte • Chicago • Cleveland • Boston • New York • St. Louis Minneapolis • New Orleans • Dallas • Houston • Pittsburgh • Philadelphia • San Francisco • IN CANADA: Standard Chemical Limited

Just between us toolpushers... Morse H-E Chain lasts 4 times longer!

WORRIED . . . 'cause deep drilling kept breaking even "special" roller chain. Chain repairs and lost drilling time were costing us plenty of money.

SURPRISED . . . when the Morse man proved High-Endurance Roller Chain lasts four times longer than other chain. Runs on standard sprockets, too.

WONDERED . . . why H-E Roller Chain costs 10% more. Now I know. It's better made . . . from tougher steels. But it pays for itself in a hurry.

GLAD . . . I tried it. Morse High-Endurance Chain is the only roller chain that'll stand up to the tough drilling jobs I run across nowadays.

Take it from a toolpusher . . . he knows from experience. Better still, insist on Morse High-Endurance Chain at your local supply store. You'll see in a hurry why H-E Chain takes today's rugged oil-field conditions better than any other roller chain you can buy.

MORSE CHAIN COMPANY, Ithaca, N. Y.—Warehouses in: Houston and Odessa, Tex.; Farmington and Hobbs, N. M. Export: Borg-Warner Intl., Chicago 3, Ill.

IN POWER TRANSMISSION
THE TOUGH JOBS COME TO

MORSE

*Trademark

Remember: Only Morse offers you all four of these basic drives: Roller Chain, Silent Chain, Hy-Vo,® and "Timing"® Belts

MUELLER® PRODUCTS

...specifically designed for water systems!

For more than a century, Mueller Co. has manufactured quality products for the water works industry. Many of these products have become standards of the industry. They meet or exceed all specifications of the American Water Works Association. Today, Mueller Co. offers a complete line of products for use in any type of water distribution system. A few of these items are shown.

GATE VALVES

Iron body, bronze mounted
Double disc, parallel seat type
"O" ring seal or conventional packing
Wide selection of ends
Sizes 2" through 48"

TAPPING MACHINES

Drills and taps holes in any pipe
For inserting corporation stops and pipe plugs into lines under pressure
Stops ½" through 2"
Plugs ½" through 4"

CORPORATION STOPS

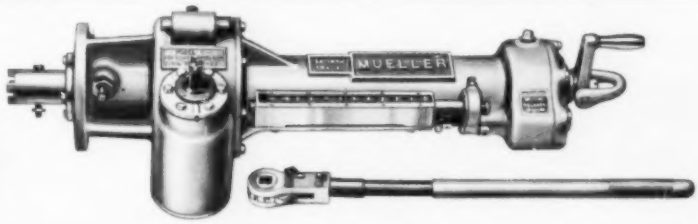
Designed for insertion into lines under pressure
Practically any combination of inlets and outlets
Sizes ½" through 2"

SERVICE CLAMPS

Single or double strap
Full range of tappings and sizes

TAPPING SLEEVES AND VALVES

Calked or mechanical joint type
Sleeves up to 48"
Valves to 24"

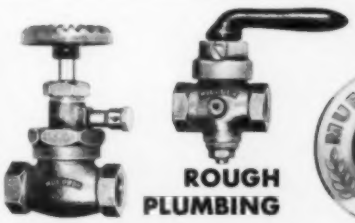


DRILLING MACHINES

For cuts from ½" through 12" in any type pipe
Hand or power-operated
Pressures to 500 p.s.i.

REGULATORS AND RELIEF VALVES

For water, steam, air, oil and gas
Sizes ½" through 2½"



ROUGH PLUMBING

Stops, stop and drains, faucets
Ground key or compression type
Wide range of sizes

MUELLER CO.

DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles
In Canada: Mueller, Limited, Sarnia, Ontario

MUELLER

Fire Protection Products

...fully approved by Underwriters Laboratories

Mueller Co. manufactures a full line of products for use in plant fire protection systems. Each item is clearly marked "SH-FM" or "SV-FM" to indicate its listing and approval by the Underwriters Laboratories of Chicago and the Associated Factory Mutual Laboratories of Boston.

NRS GATE VALVES

Iron body, bronze mounted
Double disc, parallel seat type
With indicator post flange
Wide selection of ends
Sizes 4" through 14"

INDICATOR POSTS

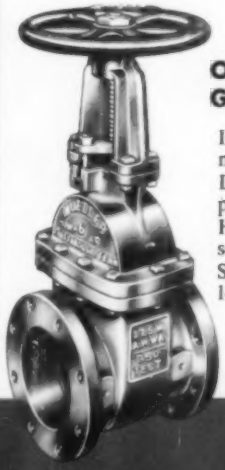
For use with indicator post valves
Adjustable or non-adjustable
Depth of bury from 1' through 7'
Valve sizes 4" through 14"

FIRE HYDRANTS

Two-way or three-way
Independent hose gate valves
"O" ring stem seal
Wide selection of ends

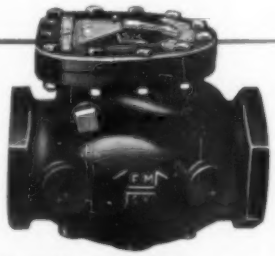
WALL TYPE INDICATOR POSTS

Barrel lengths to 18"
Handwheel diameter of 14"
Valve sizes 4", 6" and 8"



OS&Y GATE VALVES

Iron body, bronze mounted
Double disc, parallel seat type
Hub, flanged or screwed ends
Sizes 2½" through 14"



CHECK VALVES

Iron body, bronze mounted
Swing type
For vertical or horizontal installation
Hub, flanged or screwed ends
Sizes 2½" through 14"

Write direct for complete information and specifications on Mueller products for water and fire protection systems. Mueller Co. also makes a full line of NO-BLO® products for the gas distribution industry.

MUELLER CO.
DECATUR, ILL.

Form No. H-8821

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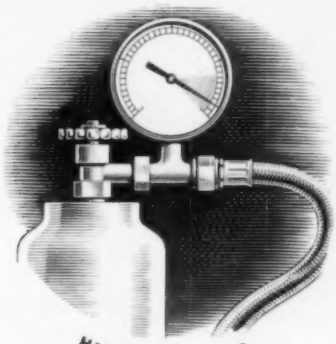
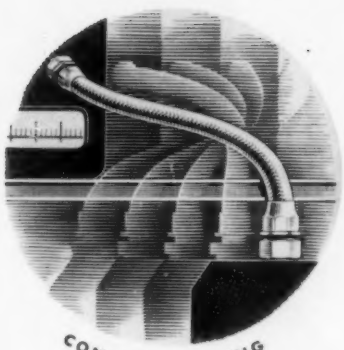


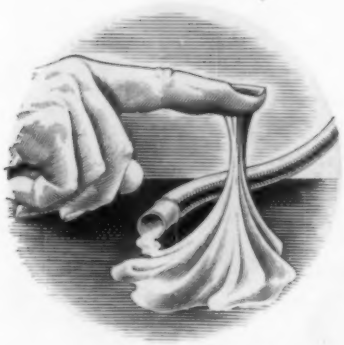
HIGH PRESSURES



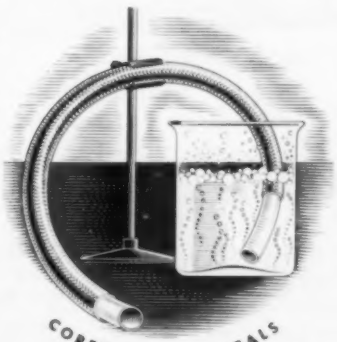
CONSTANT FLEXING

Wherever petrochemical processes demand hose that can take these conditions

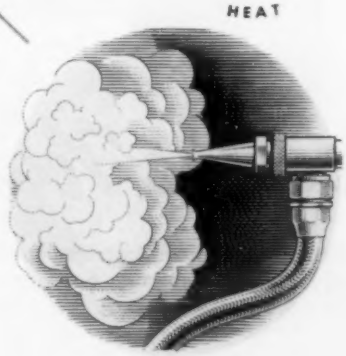
HEAT



ADHESIVES



CORROSIVE CHEMICALS



LIVE STEAM

You'll save replacement and maintenance costs with hose of TEFLON* TFE-fluorocarbon resin

Hose lines made with TEFLON* TFE-fluorocarbon resins more than pay their way wherever processing conditions are difficult. This is especially true where flexing, impulsing, or vibration must be overcome. The resins are inert to virtually every chemical encountered in oil extraction, refining and petrochemical processing. Hose can operate continuously at 500°F., and can be built to withstand 3000 psi. It handles live steam without failure, and repels adhesion of sticky or viscous substances.

That's why you can often greatly reduce operating and maintenance expenses with hose of Du Pont TFE resin. See your hose dealer or write to: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room 284, Du Pont Building, Wilmington 98, Del.

In Canada: Du Pont Company of Canada (1956) Limited, P.O. Box 660, Montreal, Quebec.

*TEFLON *is Du Pont's registered trademark for its fluorocarbon resins, including the TFE (tetrafluoroethylene) resins discussed herein.*

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

This is Why the Nash is the Most Simple Compressor

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY

313 WILSON, SO. NORWALK, CONN.

FR®

. . . standard on LINK-BELT oil field roller chain

U.S. Patent No. 2,517,497

Increased sidebar Fatigue Resistance raises chain endurance limit . . . produces unmatched dynamic strength

No ordinary roller chain can long withstand the brute punishment of drilling service. That's why Link-Belt adds the FR process—a proven way to promote longer chain life. By compressing the metal around pitch holes, Link-Belt greatly strengthens the critical sidebar areas most vulnerable to fatigue . . . thus creating extraordinary *dynamic strength.*

And FR is just one of many Link-Belt "extras":

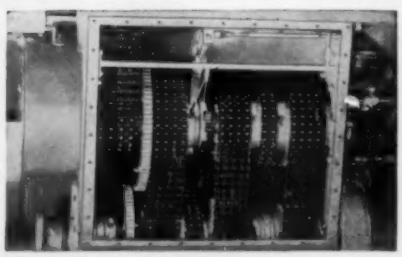
- SHOT-PEENED ROLLERS
- PRE-STRESSING
- E-Z ASSEMBLY
- CLOSER HEAT-TREAT CONTROL
- SHEPHERD'S CROOK COTTERS
- DOUBLE BOXING

Any leading supply store in the field can give you full details and a copy of Link-Belt Catalog 2780.

LINK-BELT

ROLLER CHAINS & SPROCKETS

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Shreveport, La., Los Angeles 22, (Montebello), Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields. 14,669



BREWSTER N-12 DRAWWORKS TRANSMISSION incorporates multiple-width Link-Belt Precision Steel roller chain with FR. *Since this feature involves no alteration in dimensions of chain parts,* Link-Belt roller chain is interchangeable with standard chains and sprockets.

THE PARKERSBURG RIG AND REEL CO.

QUALITY PARKERSBURG SERVICE

PARKERSBURG WEST VIRGINIA

MADE IN U.S.A.

DIVISION OF PARKERSBURG • AETNA CORPORATION

Parkersburg offers you ONE-STOP pumping unit service through your favorite supply store

Dependable, economical Parkersburg chain-driven and gear-driven pumping units are now available under these famous oil field signs. From these 14 supply companies in the United States and Canada, Parkersburg pumping units are immediately available, regardless of where your location might be.

There is a Parkersburg pumping unit to meet any requirement. Each unit is backed with Parkersburg's guarantee and liberal service policy. And Parkersburg pumping units are world-famous for dependability, economy, and performance.

Gear-driven units are offered through these supply companies in size ranges from 25,000 to 1,500,000 inch pounds peak torque rating. Chain-driven units are furnished with peak torque ratings from 25,000 to 228,000 inch pounds.

PUMPING UNIT DIVISION OFFICES:

710 Mid-Continent Building • Tulsa, Oklahoma

For the best buy for your money, look for these familiar oil field signs and specify Parkersburg Pumping Units.

CESSCO
EDMONTON, ALBERTA, CANADA

SUPPLY BOVAIRD COMPANY
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RODMAN R SUPPLY CO
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UNITED SUPPLY
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Franklin* SUPPLY COMPANY
CHICAGO, ILLINOIS

IRON WORKS SUPERIOR SUPPLY CO. INC.
SHREVEPORT, LA.

IVERSON SUPPLY CO. OIL WELL SUPPLIES
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MOUNTAIN IRON AND SUPPLY COMPANY
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HOMCO*
HOUSTON OIL FIELD MATERIAL COMPANY, Inc.

C. W. Cotton Supply Co.
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INDUSTRIAL SUPPLY COMPANY
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Midland Supply Company, Inc.
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The Producers Supply & Tool Co.
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* and Canadian Subsidiaries

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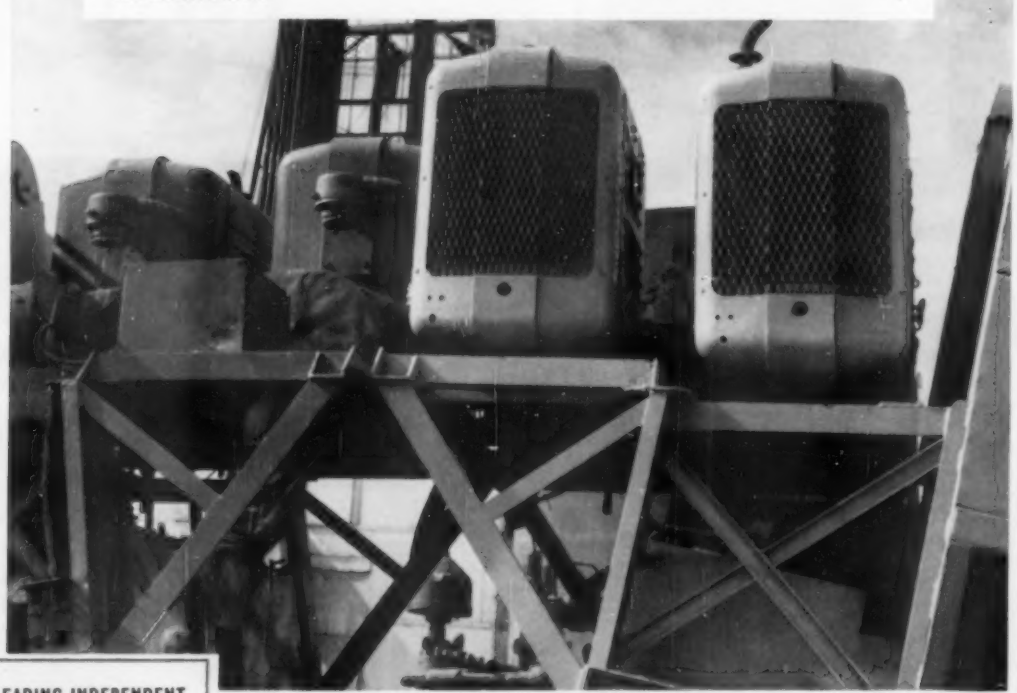
CONTINENTAL MOTORS · Powerful as the Nation · AMERICA'S STANDARD ®

... Any Equipment is Better with

CONTINENTAL RED SEAL POWER

• Any oil field equipment with a power requirement within Continental's range will run longer, for less, and with least time out, on Continental Red Seal. The reason lies in specialization—in Continental's long-standing policy of engineering each model precisely to the job to be done. Each and every model is the product of 56 years' engine-building experience. The industrial series comprises 50 different basic models, with an output range from 14 to 237 horsepower. Twelve of these are Diesels with exclusive Continental Cushioned® Power. Throughout the oil fields, on all types of installations, you'll find Red Seals powering the finest equipment—and they're available for operation on all standard fuels. Visit your nearest oil field supply store or write the factory for information.

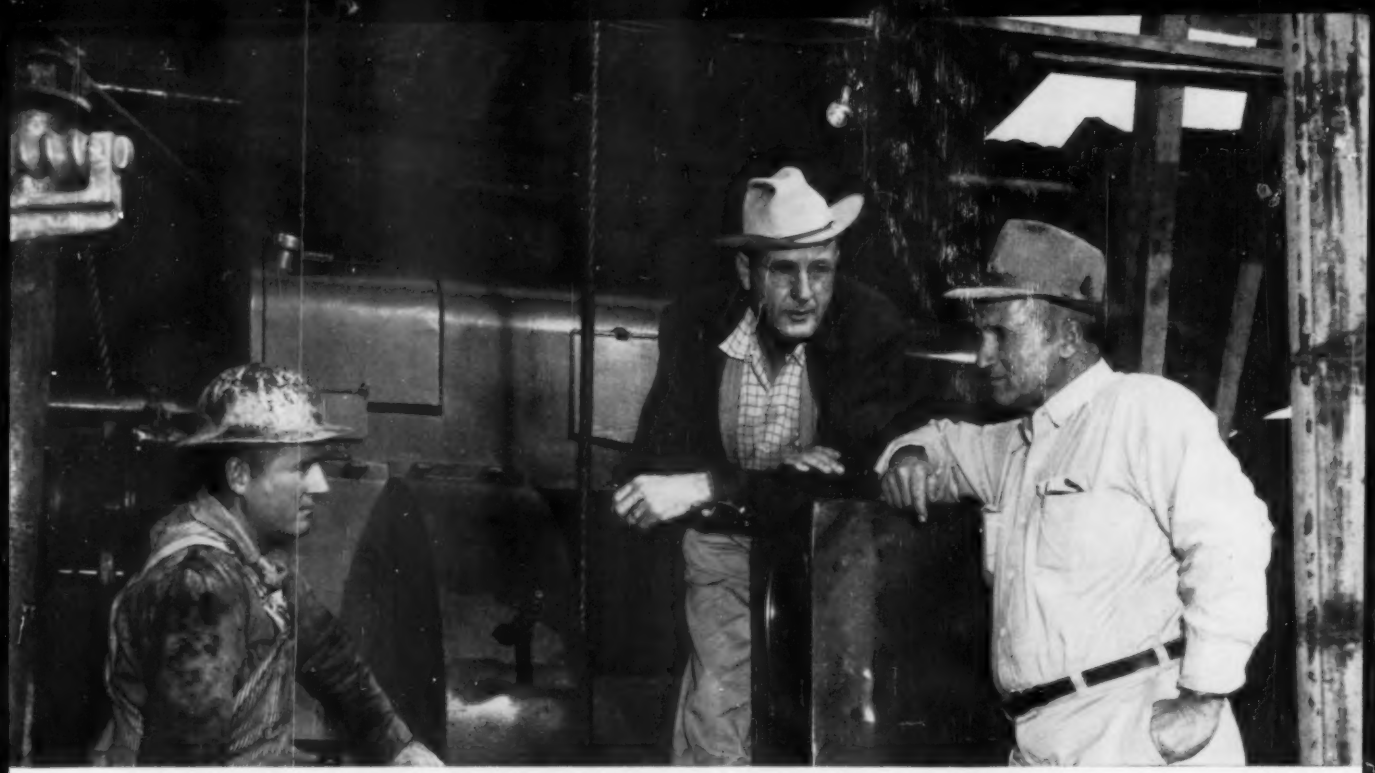


WORLD'S LEADING INDEPENDENT MANUFACTURER OF INTERNAL COMBUSTION ENGINES, CONTINENTAL MOTORS OPERATES PLANTS IN ATLANTA, DALLAS, DETROIT, MILWAUKEE, MUSKEGON, AND TOLEDO, AND IN ST. THOMAS, ONT., PRODUCING AIR-COOLED AND LIQUID-COOLED ENGINES FOR USE ON LAND, AT SEA AND IN THE AIR.

Continental Motors Corporation

MUSKEGON • MICHIGAN

FACTORY-APPROVED SERVICE AND GENUINE RED SEAL PARTS ARE AVAILABLE ALL OVER THE WORLD



No signs of wear. Inspection of Tiger Brand Rope after drilling an 8600-foot well showed it to be in excellent condition with plenty of lubrication left.

"USS American Tiger Brand is as good a line as a man can find"

Says L. E. Fannin, Tool Pusher for Trio Drilling Co., Dallas, Texas

THE TRIO DRILLING CO. has four rigs—and they are all equipped with USS American Tiger Brand Wire Rope.

The tool pusher, Mr. L. E. Fannin, keeps accurate service records of each rope and checks the wear regularly. He says, "American Tiger Brand Wire Rope is hard to beat. It's as good a line as a man can find. That's why we use it on all our rigs."

This rig was strung with 1750 feet of 1⅛" 6 x 19 Tiger Brand Excellay Preformed Monitor with an Independent Wire Rope Core. Drilling Contractors all over the oil fields have found that this rope gives them the best service at least cost. It has a high tensile strength combined with an ability to resist heavy abrasive wear.

Why Tiger Brand gives you more for the money. With every Tiger Brand Wire Rope you get the results of years of basic research in steel making plus the application engineering of American Steel and Wire. What's more, the rope is produced under a rigid system of quality controls with plant facilities unsurpassed in the industry. These are the hidden elements that assure long service life and low wire rope costs. For more information, write to American Steel & Wire, Rockefeller Building, Cleveland 13, Ohio, or contact your local distributor.

USS is a registered trademark

American Steel & Wire
Division of USS United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors · United States Steel Export Company, Distributors Abroad

Claude "Doc" Ritchie, owner of the B&B Well Servicing Company of Salem, Ill., discusses a typical oil-field job with two helpers, Pete Bryant and Lenwood Veller.

"GMC's are the best I can get for my kind of work!"

—says "Doc" Ritchie of B&B Well Servicing, Salem, Ill., in reporting on his rugged GMC oil-field trucks

Few trucks work harder than B&B's. Most of their travel is far off the road—through all sorts of mud and water—under all kinds of weather conditions. "Sometimes the mud's up to the floor boards and we have to winch 'em out with a tractor," Ritchie reports.

How well do the GMC's take it? "I find them the best truck I can get for this kind of work," says Ritchie. "Since I've been using them, my maintenance and repair costs have dropped to an amazing new low."

He's talking about a whole range of GMC models, too. His W500 tandems, for example, haul huge rigs and heaviest equipment. GMC 370's tote most of the medium-size gear. And there are four GMC pickups – handling personnel transportation, errands and utility chores.

Every one of these GMC Money-Makers has one thing in common: *Built-in ruggedness and endurance well beyond the need.* And it pays off—right down to the pickups—in lower operating costs, fewer repairs—and longer truck-life.

So why not put a Money-Maker to work for you? For the type you want—for the job you're doing—see your GMC dealer!

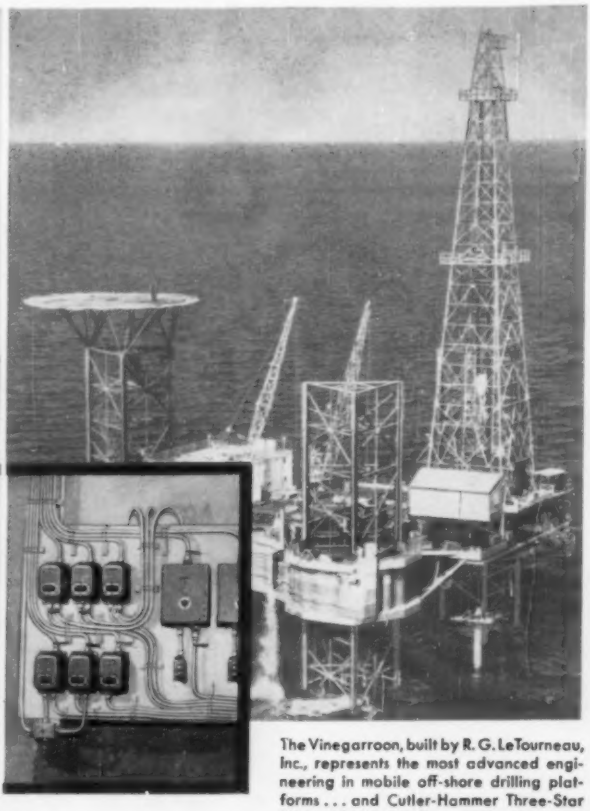
GMC TRUCK & COACH—*A General Motors Division*

GMC—America's Ablest Trucks

½ to 45 TONS

From the Wyoming oil fields to the "Vinegarroon" in the Gulf of Mexico Cutler-Hammer motor control sets the pace

Cutler-Hammer Three-Star Oil Well Pumping Control provides completely automatic pumping service day after day . . year after year.



The Vinegarroon, built by R. G. LeTourneau, Inc., represents the most advanced engineering in mobile off-shore drilling platforms . . . and Cutler-Hammer Three-Star Motor Control is the standard control equipment.

Experienced engineers in the oil industry know the true importance of dependable motor control. Not only must it direct and protect the operation of all electrically driven machines and equipment used throughout the industry, but it must do so even when subjected to the ravages of blistering heat, choking dust, driving rain, sleet and snow, and corrosive salt-spray. Demanding conditions such as these put much meaning into the fact that more Cutler-Hammer Motor Control is being supplied to the oil industry than ever before.

Whatever your requirement for motor control may be, be sure you get the very best . . . Cutler-Hammer Three-Star Motor Control. It's star studded with extra features which guarantee exceptional performance and lasting dependability . . . at no extra cost.

CUTLER-HAMMER Inc., 1453 St. Paul Avenue, Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto.

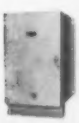
For extra dependability at no extra cost . . . specify

CUTLER-HAMMER ☆ ☆ ☆ MOTOR CONTROL C-H

GENERAL PURPOSE CONTROL

HEAVY DUTY SAFETY SWITCHES

COMBINATION STARTERS



REDUCED VOLTAGE STARTERS

OIL WELL PUMPING CONTROL

UNITROL

OIL-TIGHT PUSHBUTTONS AND CONTROL STATIONS

UNIBOLT
flow manifolds

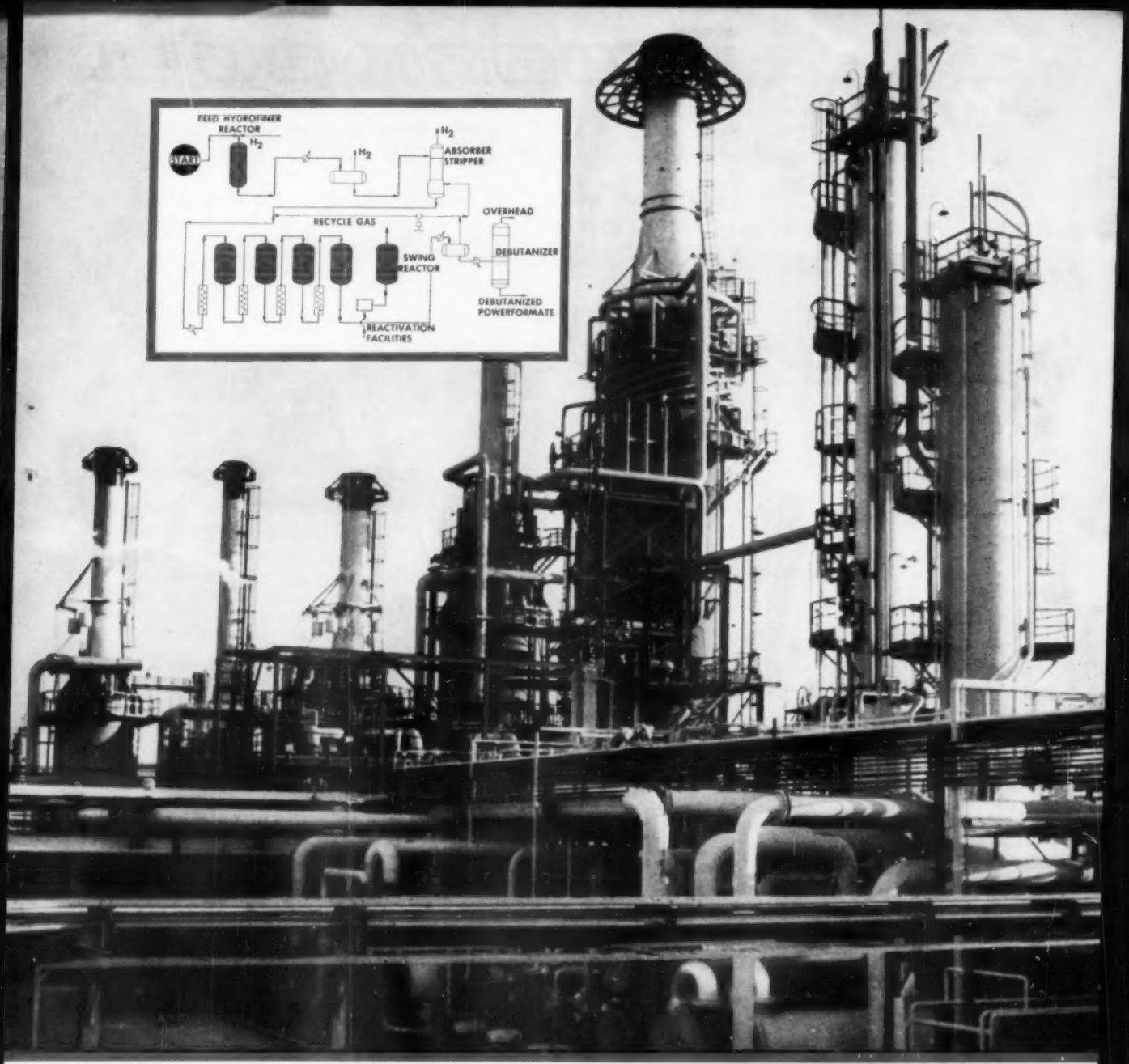
More and more operators are requesting their Christmas tree supplier to furnish UNIBOLT Flow Manifolds because they are lighter in weight, stronger, economical and easier to maintain.

Employing standard UNIBOLT connections rather than flanges, the UNIBOLT Flow Manifold is many pounds lighter, yet the UNIBOLT design, which places more steel in shear, actually results in a higher factor of safety for the manifold.

The three parts of the manifold — UNIBOLT Tee or Cross, Adjustable Wing Valve, and Positive Choke Body — are pressure-tested as a unit and may be assembled in a number of combinations to best meet individual needs. They are furnished in regular forged steel or in high-chrome alloy for corrosive wells — 6,000, 10,000 and 15,000 lbs. test.

The manifold is completely salvageable, either as an assembly or as individual units. Since all of its connections are standard UNIBOLT design, each unit freely interchanges with any other UNIBOLT product of the same size and rating.

THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS



POWERFORMING PROCESS CAN INCREASE YOUR HIGH OCTANE YIELD

Esso Research and Engineering Company offers you *Powerforming*, the most versatile platinum reforming process ever developed. *Powerforming* is another achievement of the Esso Research program — 38 years of new process developments which have been made available to refiners around the world.

Heart of the *Powerforming* process is a new, more active platinum catalyst. High activity over a long life is assured by significant new regenerative techniques. With this new process, good yields of 100 octane clear Powerformate can even be obtained from paraffinic stocks. Twelve *Powerforming* installations are on stream; twenty-one are in the planning or construction stage. Licensees enjoy benefits of continuing *Powerforming* research. We would welcome your inquiry on the part *Powerforming* can play in *your* modernization plans.

ESSO RESEARCH AND ENGINEERING COMPANY

P.O. Box 243, Elizabeth B, N. J.

Your key to progress... an Esso Research process

WORK BULL

ALL NEW!

Power-matching of the Work Bull 202 and the Davis Loader-Backhoe eliminates need for bumper, provides greater reach, maneuverability, and "single-unit" efficiency. Built-in mounting assures easy installation, service.

Exclusive! With a Davis 210 Backhoe, the Work Bull 202 digs flush. Boom and mast assembly shifts from center to either side. 200° arc.

All-weather operation. Cab on Davis Backhoe gives excellent visibility . . . has no blind spots. Cabs also available for tractors.

Work Bull 303 with 500 Loader and Davis Backhoe. Provides highly versatile, heavy-duty rig with utility-type mobility.

Auburn Trencher on the Work Bull 202 will dig in more adverse conditions than any other trencher. It digs to 6' and various widths.

and DAVIS EQUIPMENT

POWER-MATCHED

TO SAVE YOU MONEY ON DIGGING, TRENCHING, DOZING, BACKFILLING, AND MATERIAL HANDLING!

Here is the most efficient and versatile line of light and medium industrial equipment ever made available from a single source – with a single responsibility for both sales and service.

New Work Bull and Davis Products have been designed and integrated to each other so they work together as a unit. Numerous other attachments have been "power-matched" to the Work Bulls to let you pick the power – then add whatever attachments you need to match your project. They are unsurpassed for increasing production on excavating, trenching, loading, leveling, and material handling jobs . . . while actually lowering operating costs.

The **Work Bull 202** has high-torque, 40 h. p. engine that delivers amazing lugging power at low speeds. Full-time power steering, dual-range multi-speed transmission plus many other features increase "on-the-job" efficiency.

Equipped with "matched" Davis Loader-Backhoe you get the most efficient, all-around rig in the utility class.

For larger operations, choose between the **Work Bull 303** with special "power-matched" **Model 500 Loader and Davis Backhoe** . . . or the **Work Bull 1001** Multi-purpose Tractor Loader which is convertible into 8 different machines.

The Work Bull 303 and 1001 feature instant, no-stop reversing without shifting, power-steering, torque converter, direct-line thrust, 52 h. p. engine.

The **Davis Backhoe** is the only machine in the world that lets you dig flush alongside obstructions – as well as handle normal digging assignments. It features 10,000 pounds breakaway, exclusive seat that revolves with the boom so you always face your work . . . and many other features.

Ask for a demonstration of the new Work Bull and Davis equipment including the Work Bull Fork Lift for off-hard surface operations. See if you don't agree that it's the best investment you can make in equipment.

OTHER ALL-NEW POWER-MATCHED ATTACHMENTS FOR WORK BULL EQUIPMENT GIVE UNSUPPASSED VERSATILITY

Other power-matched equipment for Work Bull tractors include the famous Auburn Trencher, a pipe and cable layer, post hole digger, soil scoop, cordwood saw, telescoping wagon chassis, side-mounted mower, scarifier-scraper, and multi-purpose blade. In addition, numerous attachments are available for the Davis Loader, Work Bull 1001, and the Work Bull 500 Loader.

Ask for a Demonstration. Write for Name of Dealer and Fully Illustrated Booklet on the Complete Work Bull and Davis Line. Ask for Booklet G-4.

MASSEY HARRIS FERGUSON, INC.

MASSEY-FERGUSON INDUSTRIAL DIVISION

1009 SOUTH WEST ST. • WICHITA 13N, KANSAS

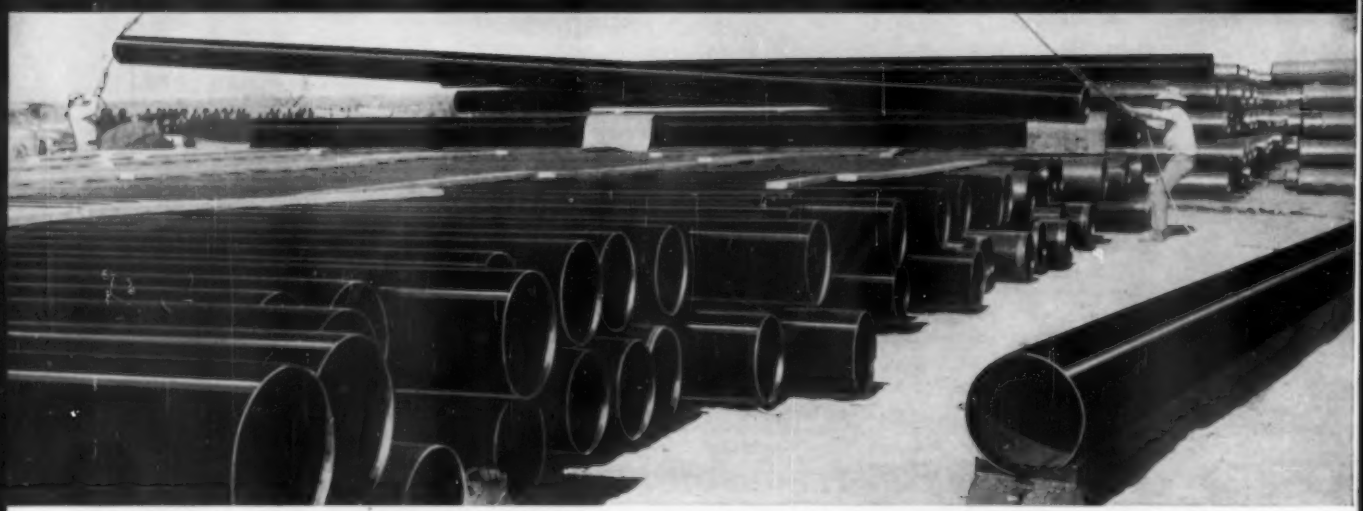
Pipe and Cable Layer buries plastic pipe and electric cable up to 1½" diameter to a depth of 18½" at the rate of 2 to 3 mph.

Work Bull 1001 has instant reversing, 43° roll back, and direct-line thrust for "bull-dozer" digging action. Converts into eight different machines.

Work Bull 303 and the Massey-Ferguson Wagon team up to move equipment right on the job. Wagon is ideal for transporting welders, compressors, etc.

The Work Bull Fork Lift – has 10 different attachments – most efficient materials handling and maintenance unit for off-hard surfaces.

Now, lay coated pipe without "Special" handling



ABOVE: 16-inch pipe being spray-coated for use in new Transcontinental Gas Pipe Line Corp. gas-gathering system near Tilden, Texas.

Save up to 20 per cent in laying costs on large-diameter pipelines. Spray—coat pipe with Copon Arocoat before installation. Then, haul it, stack it, bend it and lay it with little more care than you would use for bare pipe. Tough Copon Arocoat coatings will survive these operations without chipping or cracking, and Copon Arocoat can be applied to welds with an ordinary paint brush.

A combination of epoxy and coal tar resins, Copon Arocoat coatings provide superior corrosion control. They will not deteriorate in the ground . . . remain tough and elastic . . . and are unaffected by temperature extremes. Successful applications include submerged, buried and exposed transmission lines.

Get complete information on Copon Arocoat, industry's newest weapon in the fight against rising costs of corrosion. Write today to the Copon Associate located nearest to your city.

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FOR CORROSION CONTROL

VOGT identification Disc...

...on top and in sight

makes it easy to identify valves —even in insulated lines

The Vogt tell-all identification disc, on every valve, is permanently located above the handwheel for complete and convenient identification. It shows valve size, catalog and drawing number, materials used for principal parts and primary pressure and temperature ratings. The flat on the handwheel protects the disc in assembly and in service.

Vogt GP Valves are available in a complete range of sizes from ¼" to 2", with HAYNES STELLITE* faced seating surfaces and rated 800 pounds at 850° F. and 2000 pounds at 100° F. (Other types are available through 8" size.)

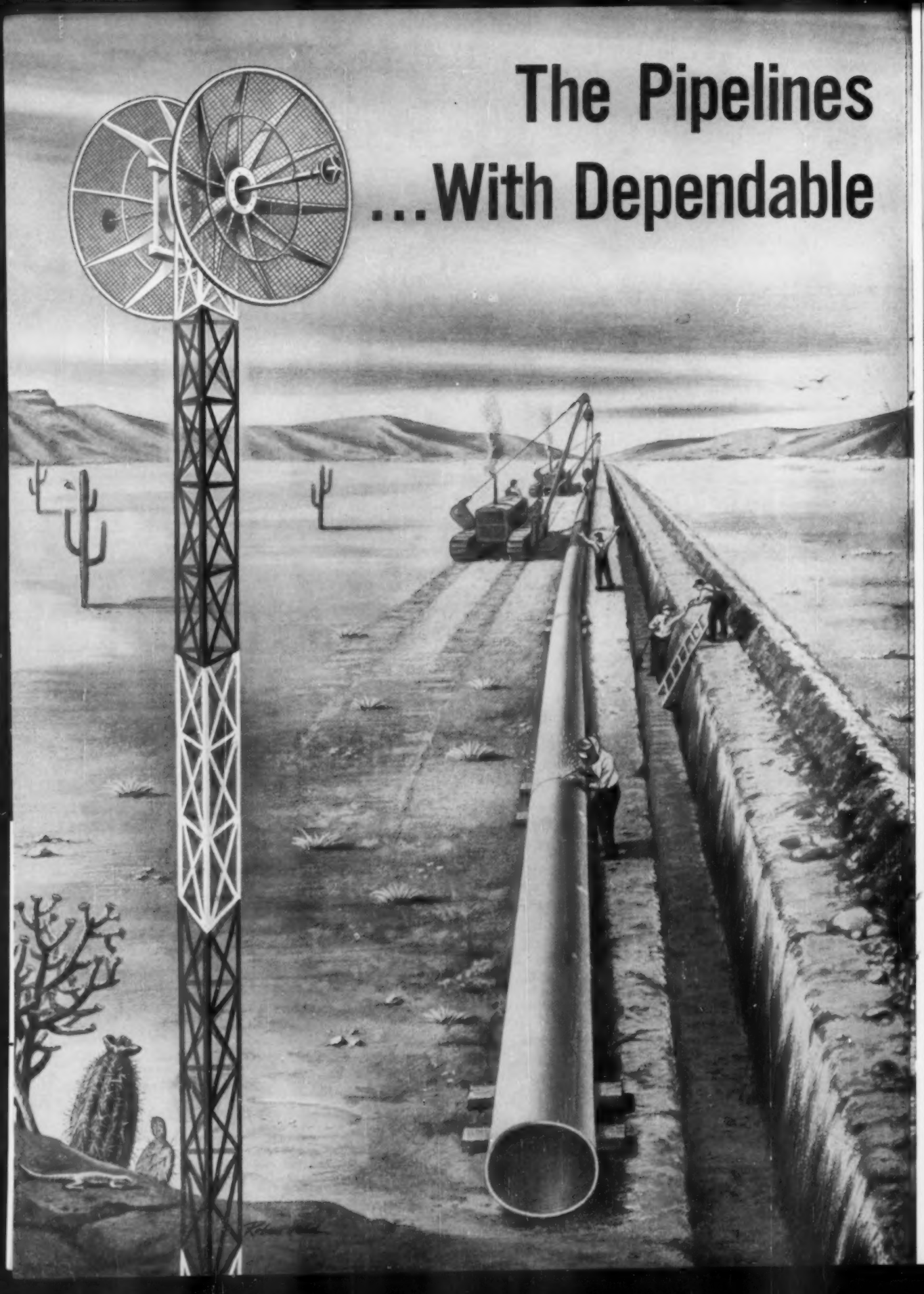
*Trade-Mark of Union Carbide and Carbon Corporation

HENRY VOGT MACHINE CO.
P. O. BOX 1918, LOUISVILLE 1, KY.
SALES OFFICES: New York, Chicago, Cleveland, Dallas, Philadelphia, St. Louis, Charleston, W. Va.

Write For Your FREE COPY of Supplement No. 1 to Catalog F-9. Address Dept. 24A-FQ.

Vogt GENERAL GP PURPOSE Vogt FOR BETTER VALVES **DROP FORGED STEEL VALVES**

Adv. No. 7 in a series describing the features of Vogt GP Valves.


The Pipelines
...With Dependable

Look to Remote Control
RCA MICROWAVE RADIO

A giant industry . . . already transporting trillions of feet of gas, billions of gallons of crude oil and products, in hundreds of miles of underground pipeline . . . is expanding its facilities to double . . . triple . . . quadruple its capacity! As the pipelines grow, they count on microwave radio relay to control operations. Today, the pipelines are the biggest private users of microwave.

Dependable RCA microwave provides multiple voice channels, assuring faster, less expensive service than leased lines; also circuits for telemetering, facsimile, fault reporting, supervisory control. Channel capacity (up to 90 channels), provided in the initial installation, gives the users "built-in" potential for adding remote control functions in the future.

IN UTILITIES—In the comparably great utility industry expansion, RCA Microwave Radio is providing vital communication functions, including voice, teletype, telemetering, supervisory control, load control, facsimile, remote control. High-speed tone usage also can be provided.

IN OFF-SHORE DRILLING—Microwave radio relay systems are now being installed in off-shore operations to provide communications for coordinating production and pipeline operations. Microwave has been selected because of crowded VHF radio conditions and because it easily provides facilities for such additional services as telemetering and equipment control.

COMPLETE SYSTEMS—including erection of towers, equipment housing, emergency power and construction of desired facilities—will be installed under supervision of specially trained engineers; can include circuits for mobile radio control. Nationwide services of RCA Service Company are provided to keep your system operating at its peak.

ON TURNPIKES—On the new superhighways RCA Microwave Radio provides dependable circuits for voice, facsimile, teletype, VHF control, traffic and business machine communications, giving operating personnel complete control, assuring greater road safety and service for patrons.

IN COMMON CARRIERS, AND AT WATERWORKS—The reliability and economy of RCA Microwave Radio make it ideal for telephone company applications. It is also gaining increased application as a communications medium for transmitting water level data to out-of-town water plants.

RCA MICROWAVE RADIO offers the most advanced engineering features. Techniques standardized and proved in 1700 to 2700 mc portion of spectrum; maintenance simplified by use of highly perfected UHF triode tubes, non-regulated power supplies; ease of field tuning through use of straight forward circuits and standard equipment units that are easily maintained. Single sideband frequency division multiplexing conserves frequency spectrum and gives assurance against obsolescence. Only two frequencies required. Provision for easy addition of future channels makes RCA Microwave the least expensive form of communications per channel mile.

RCA MICROWAVE . . . performance proved in more than a million channel miles of operating systems throughout the world.

Mail coupon for complete information.

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Engineering Progress Report

FROM UNION CARBIDE CHEMICALS COMPANY

Side Stream Distillation Reduces Cost of Gas Sweetening Operations

Control monoethanolamine contamination by eliminating foreign materials

Monoethanolamine reacts with weak acids such as hydrogen sulfide and carbonic acid at ambient temperatures to form salts. Then, these salts decompose when heated to the boiling point of water, liberating the acidic gases and freeing the monoethanolamine for recirculation to pick up more acid gas. This provides an economic cyclic process for absorbing these undesirable materials from a gas stream. Because of this, practically all gas sweetening in the United States is accomplished by means of the ethanolamines. Union Carbide Chemicals Company's Technical Service Department is continually engaged in research designed to give better engineering service to users of CARBIDE's ethanolamines.

MOST UNITS ARE TROUBLE-FREE

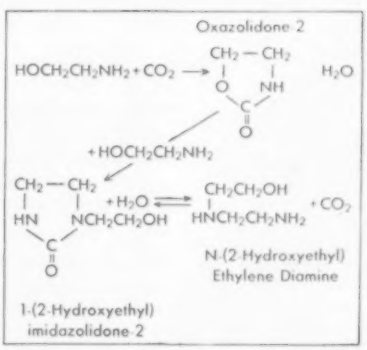
Most of these plants have operated for years without difficulty. However, experience with both aqueous-amine and glycol-amine solutions shows that in some plants the solution gradually loses capacity to absorb acidic gases and may become corrosive.

Research has shown that monoethanolamine contamination can be controlled by a simple side stream distillation system which removes foreign materials and amine degradation products. Thus, sewering can be avoided.

FORMATION OF AMINE DERIVATIVES

Examination of used aqueous and glycol-amine solutions led to the isolation and identification of two monoethanolamine conversion products, namely, 1-(2-hydroxyethyl) imidazolidone-2 and N-(2-hydroxyethyl) ethylene diamine.

It was found that this reaction actually takes place at a very slow rate in some plants handling carbon dioxide. A similar reaction



yielding similar products does not occur when only hydrogen sulfide is present.

EFFECT OF AMINE DERIVATIVES

Formation of imidazolidone reduces the effective monoethanolamine concentration and increases solution viscosity. High concentration may aggravate precipitation of residues in equipment. N-(2-hydroxyethyl) ethylene diamine will pick up acid gases, but release them only with difficulty. The acid gas salt of this stronger amine may contribute to plant equipment corrosion.

DEGRADATION PRODUCTS REMOVED BY SIDE STREAM DISTILLATION

Commercial experience proves that it is possible to remove the imidazolidone from fouled plant solutions by side stream distillation at atmospheric pressure. Batch-wise operation handling approximately 1 per cent of the circulated solution has been successful. Vacuum distillation equipment has been equally successful in the case of glycol-amine solutions.

While the substituted ethylene diamine can be efficiently removed in aqueous monoethanolamine systems, it can not be removed from diethylene glycol-monoethanolamine mixtures as its boiling point is within a few degrees of that of diethylene glycol.

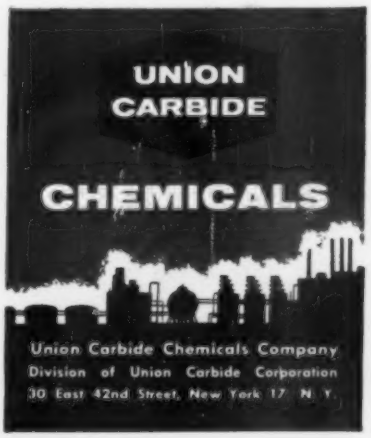
However, the imidazolidone and diamine are in equilibrium. Therefore, reduction of the imidazolidone concentration causes the diamine to revert to imidazolidone. This results in an ultimate removal of both the imidazolidone and the diamine.

In addition, side stream distillation also removes inorganic salts, organic materials with boiling points higher than monoethanolamine, and heat stable monoethanolamine-acid reaction products.

TECHNICAL SERVICE AVAILABLE

CARBIDE offers many technical services to the gas conditioning industry. If you have a gas treating problem, call the nearest CARBIDE technical representative or write Union Carbide Chemicals Company, Department B, 30 East 42nd Street, New York 17, New York.

"Union Carbide" is a registered trade-mark of Union Carbide Corporation



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5905

CF&I SEAMLESS casing and tubing

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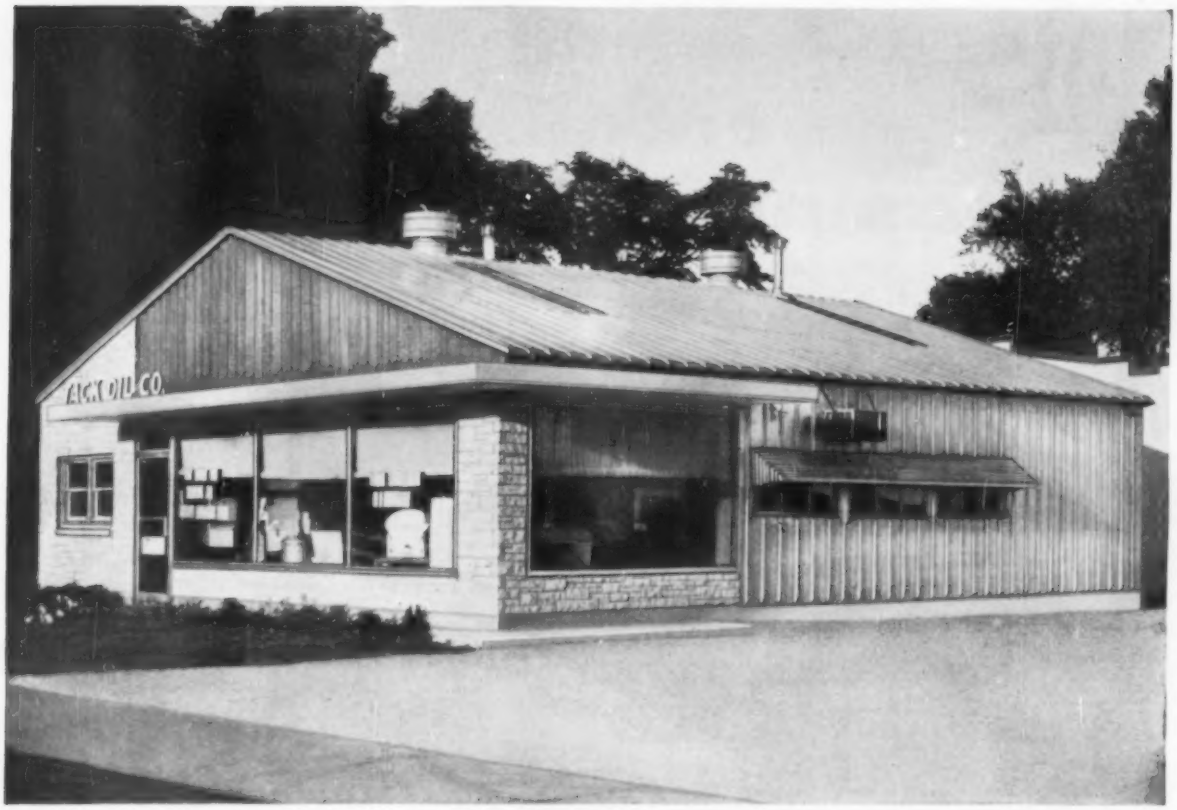

Build attractively...economically

use the Butler Building System

The savings the Butler system of building effects over traditional building methods often more than pays for the stone, glass or other materials needed to create a distinctive building that will favorably impress your customers and neighbors.

This distinctive supply house was created economically by using the same system of building used to erect low-cost Butler metal buildings in oil fields from Canada to the Gulf of Mexico.

The same mass-produced, pre-engineered structurals form the load-bearing skeleton. The same precision-made, die-formed metal panels form the weather-tight, fire-safe roof. These standardized components permitted substantial savings in engineering and construction time, materials and labor. Economical, nonload-bearing curtain walls of glass and brick were used to create a distinctive exterior.

Interiors are spacious. Butler's clear-span, rigid-frame construction provides column-free interiors, unobstructed overhead space from floor to roof peak.

Get the full story on these and the many other advantages the Butler system of building offers over traditional construction methods. Contact your Butler Builder. He's listed in the Yellow Pages under "Buildings" or "Steel Buildings." Or write direct.

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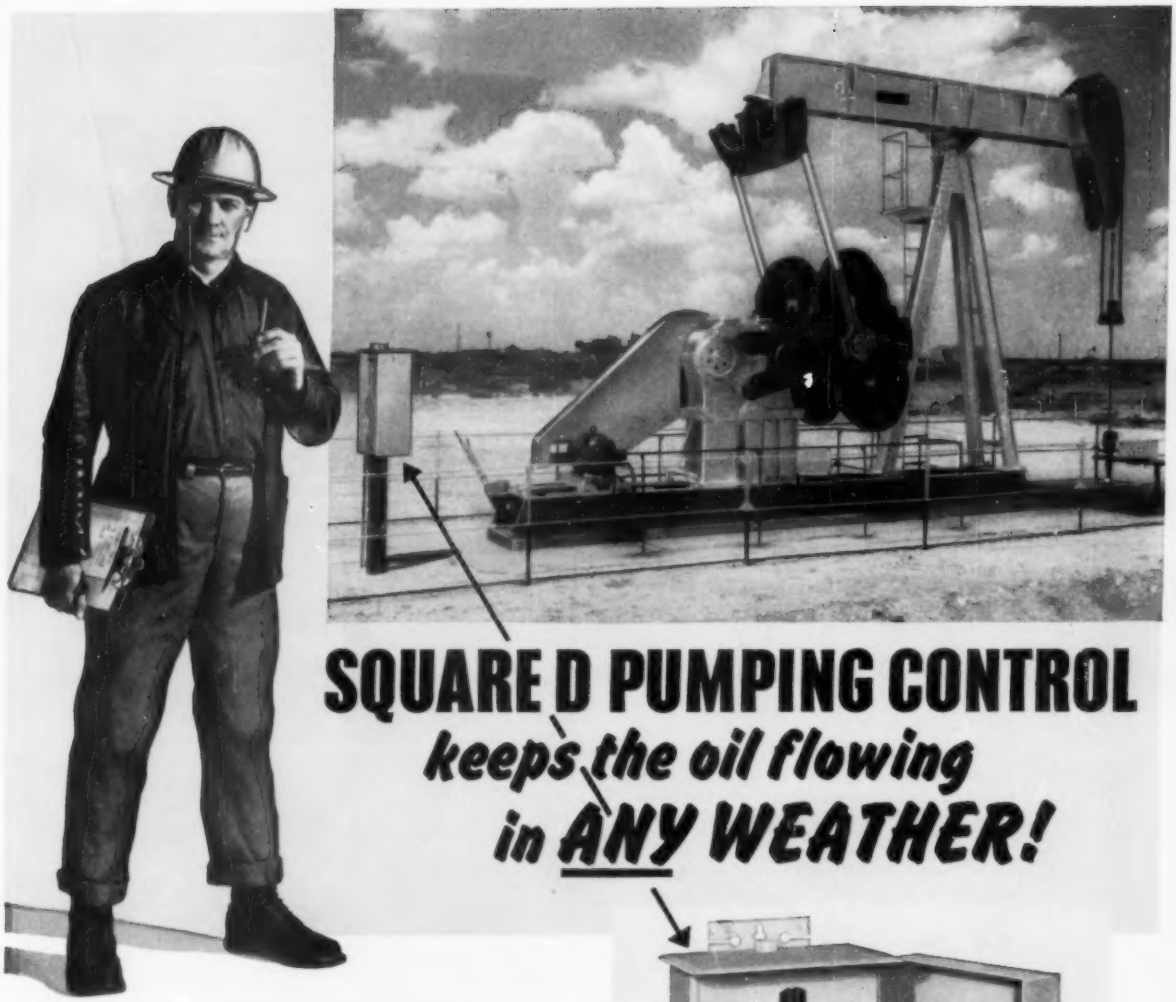

SQUARE D PUMPING CONTROL

keeps the oil flowing in ANY WEATHER!

So it rains, snows, sleets or hails—weather-resisting NEMA Type 3 enclosure with protective hood and anti-corrosion finish guards control against the foulest weather.

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Write for Oil Well Pumping Control Bulletin #8943-4. Address Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin.

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- Double case construction isolates measuring element from distortional effects of piping strains and line shocks
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- Positive displacement accuracy with vibration-free performance of true rotary operation in complete static and dynamic balance
- Only 2 moving parts in measuring element, with no metal to metal contact to cause wear
- Simple dry adjustment while meter is in operation

In hundreds of installations, the continuous high volume runs of pipeline service have proved the higher sustained accuracy and lower maintenance of Brodie *BiRotor* Meters. For crude or product measurement at its best, consider the exclusive advantages of *BiRotor* design and performance. Write today for full details.

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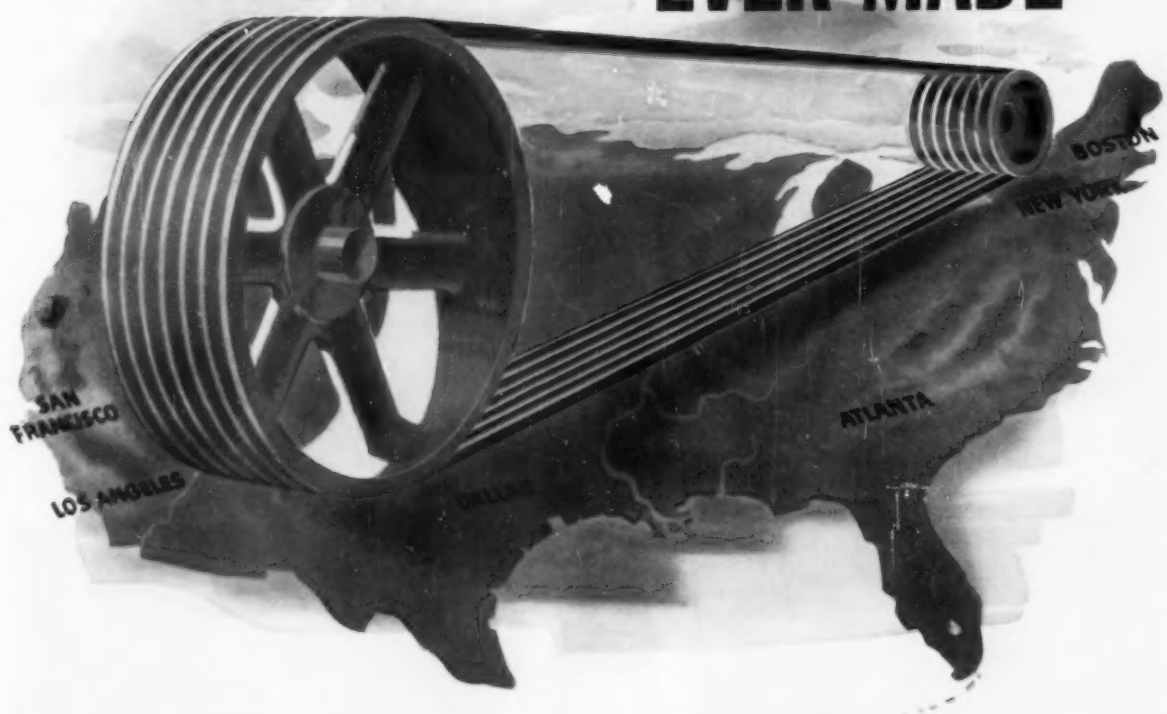

Proves unequaled "match-ability" of U.S. Rubber V-Belts

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Contact any "U. S." power transmission distributor, or write us at Rockefeller Center, N. Y. 20, N. Y.

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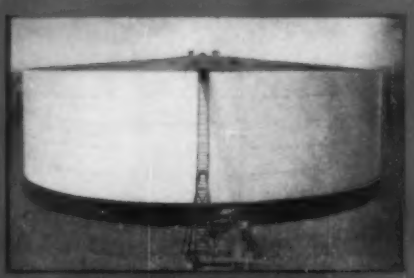

Cone Roof Tanks

The universal acceptance of Hammond-built equipment is the result of more than half a century of experience in the design, fabrication and erection of storage tanks, process vessels and steel plate construction for the petroleum, chemical and allied industries, and for water supply.

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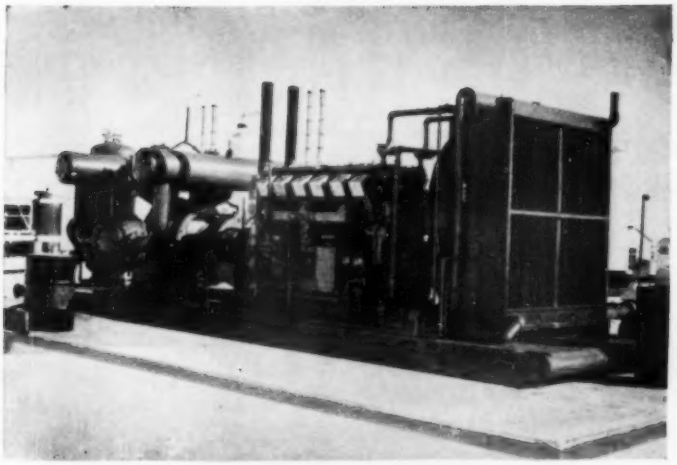
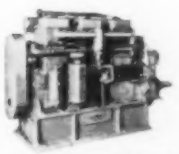


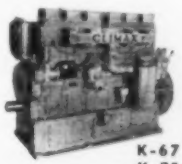
FOR POWERING COMPRESSORS

HORSEPOWER RATINGS(1)											
Model	No. of Cyls.	Bore and Stroke	Cu. In. Displ.	WITH Radiator and Fan				WITHOUT Radiator and Fan			
			(2)	800	900	1000	1030	800	900	1000	1030
R-165	6	6⅛x7	1238	85	95	103	105	90	101	110	113
K-67	6	7x7	1616	118	131	143	146	122	137	150	154
K-75	6	7⅛x7	1855	135	151	166	169	139	156	172	176
V-80	8	7x7	2155	153	171	187	190	157	177	195	200
V-85	8	7⅛x7	2474	181	200	216	221	186	206	224	230
V-122	12	7x7	3232	238	265	288	293	244	272	298	304
V-125	12	7⅛x7	3711	276	312	340	346	284	319	350	357

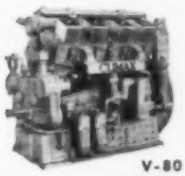
(1) These are continuous duty (65%) ratings.
(2) R.P.M.



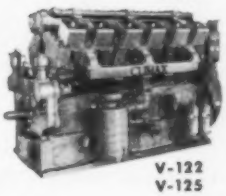
R-165



K-67
K-75



V-80
V-85



V-122
V-125

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IN THE OIL INDUSTRY

Here's Why

1. All models have a 7" stroke.
2. All main and connecting rod bearings are the precision type.
3. All intake and exhaust valves are the free-to-rotate type.
4. All cylinder blocks are provided with renewable sleeves (except R series).
5. All cylinder blocks are cast separate from the crankcase.
6. All pistons are aluminum, cam ground and have five (5) rings.
7. All crankshafts have a main bearing on each side of each crankthrow (except R series).
8. All connecting rods are rifle-drilled for pressure lubrication of piston pins (except R series).
9. All cylinder heads have Climax high turbulence type combustion chambers which produce maximum fuel economy.
10. All crankcases and engine bases have large hand holes on each side for easy access to main and connecting rod bearings and the oil pump.
11. All models have the Climax consistent design that makes possible maximum interchangeability of wearing parts.

These important features mean less down time, easier and faster field servicing and lower maintenance costs.

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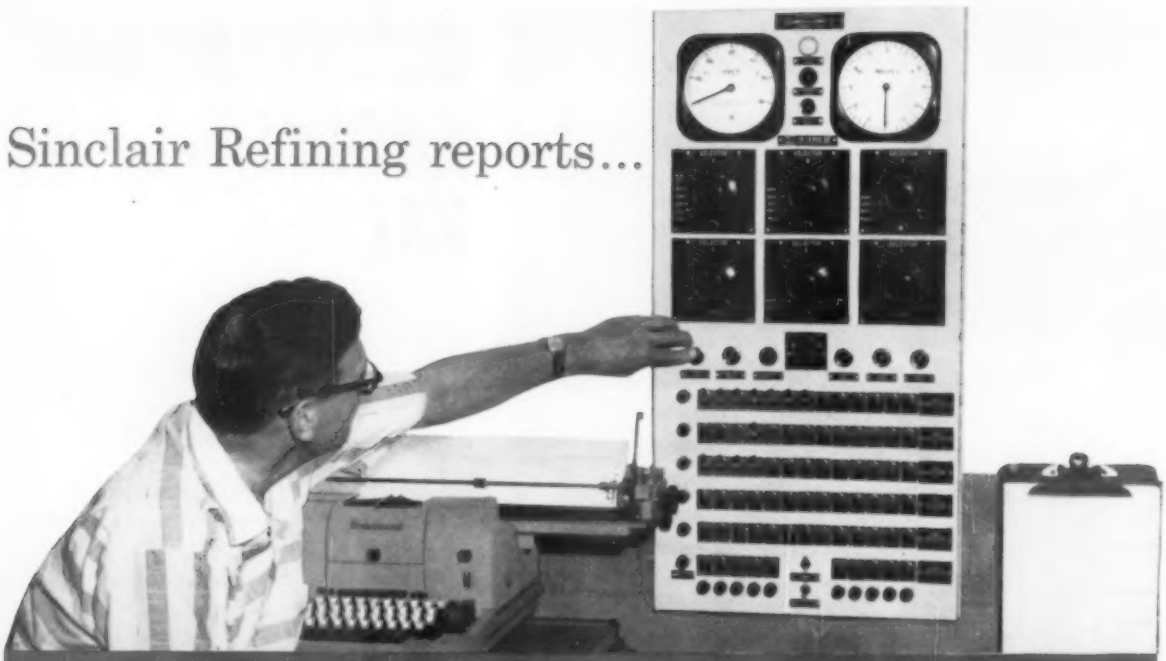
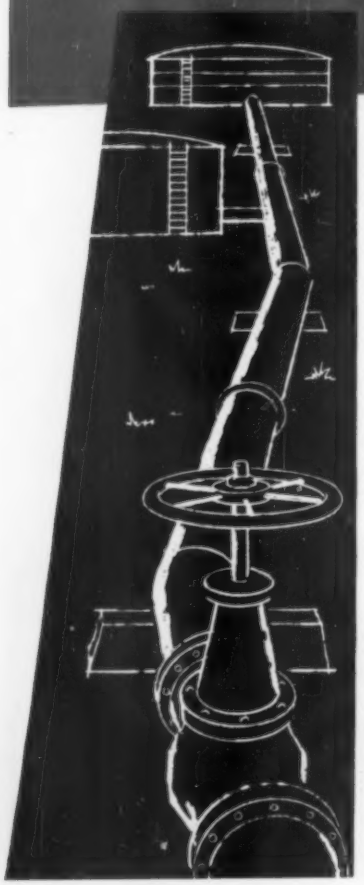
CLIMAX ENGINE MANUFACTURING CO.
DIVISION OF WAUKESHA MOTOR COMPANY

FACTORY—CLINTON, IOWA

Sinclair Refining reports...



Instantaneous, accurate gaging with S&J Datalogger!



Sinclair's new S&J Datalogger permits reliable tank gaging regardless of time or weather conditions. In addition, the S&J Datalogger provides permanent records for checking each day's operation at Sinclair's Hartford, Illinois refinery.

Proven S&J Dataloggers are ready now to help you get records of tank levels, temperatures and other physical data—faster and more accurately.

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WITHOUT GOING NEAR THE LEASE

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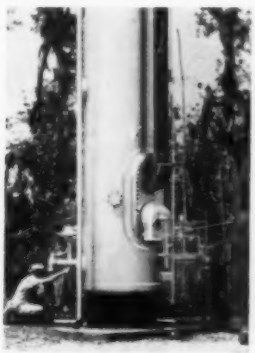
Your Tretolite field service engineer is always on call . . . always ready to help you. He will gladly survey your treating operation to make sure it is as efficient as it can be.

Here are some important treating factors he will check:

1 TREATING CHEMICAL. Is it the best for your operation? Your Tretolite engineer will make tests and make sure.



2 MECHANICAL OPERATIONS. A faulty pump, a damaged valve, and many other mechanical factors can affect the severity of emulsification. Your Tretolite engineer will consult with you on such possibilities.

3 CHEMICAL-HEAT BALANCE. Sometimes a little more chemical or a more efficient chemical can be used to reduce heating. The use of less heat can cut vapor losses which reduce gravity. Often a few points gain in gravity can earn a better selling price. Your Tretolite engineer will be glad to check this phase of your operation for you.

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It's the Tretolite Field Service Engineer's job to help you produce salable oil for less money. There is no charge for this service.

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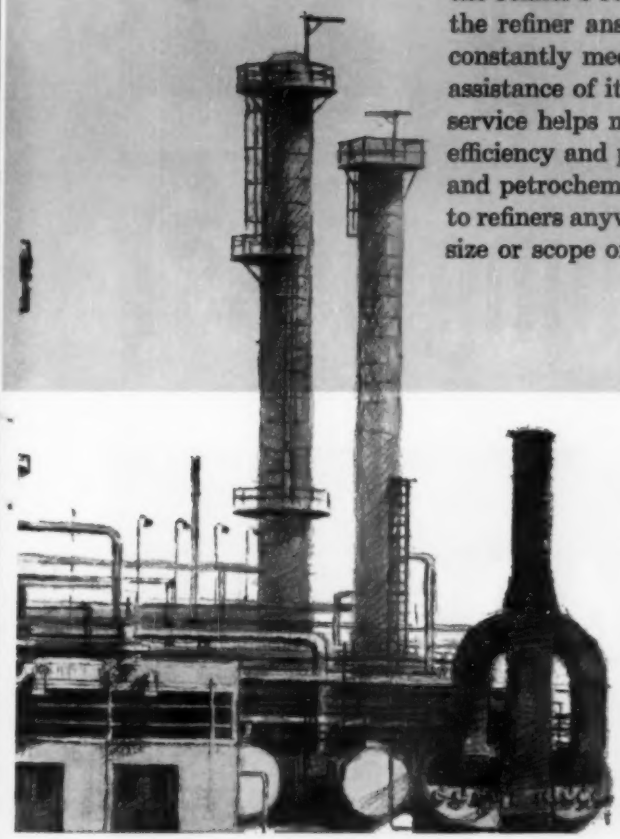

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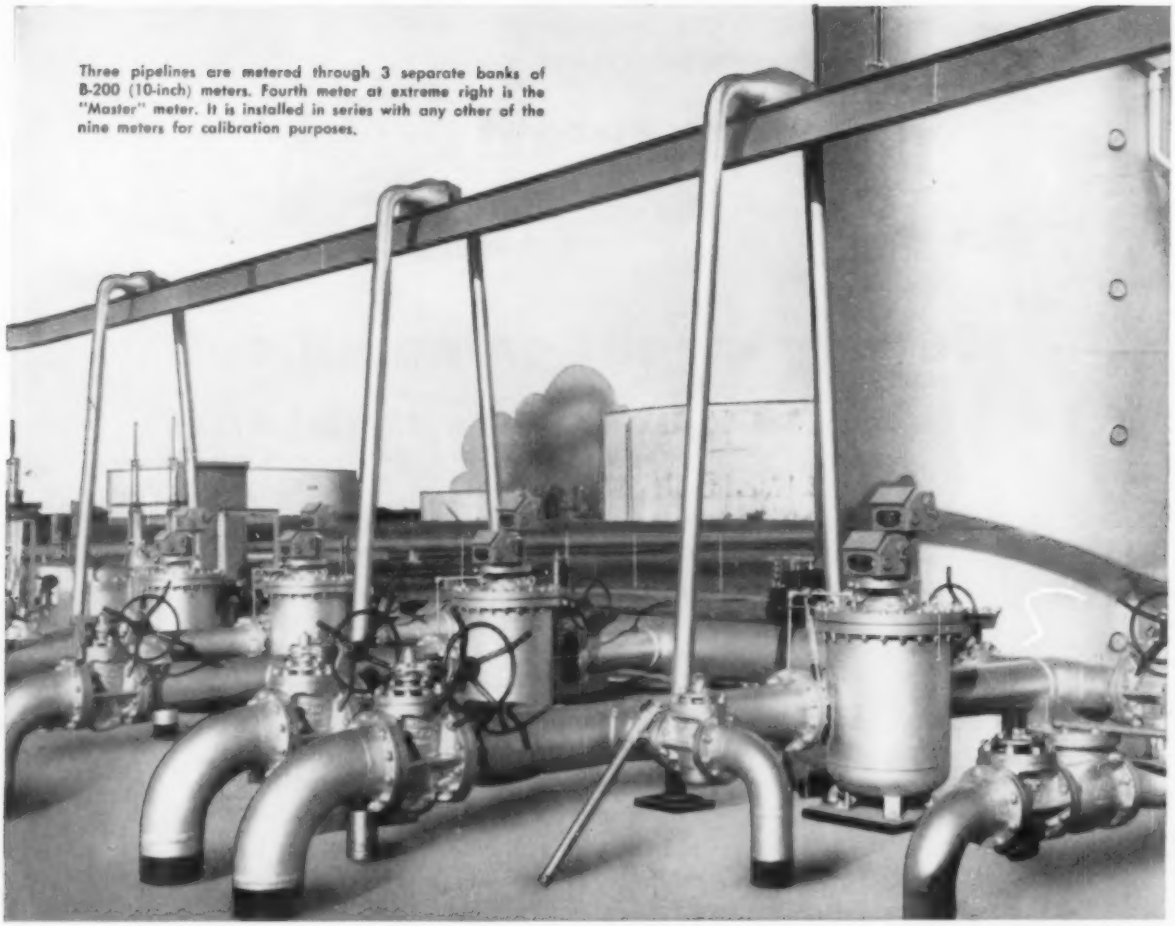

Three pipelines are metered through 3 separate banks of B-200 (10-inch) meters. Fourth meter at extreme right is the "Master" meter. It is installed in series with any other of the nine meters for calibration purposes.

three A. O. Smith meter banks effect savings by

Cutting Breathing Loss!

for major crude pipeline located in the Gulf South

This installation of A. O. Smith pipeline meters reduces breathing losses by eliminating tankage used for measurement purposes. Crude runs are dispatched directly to the refinery.

Daily throughput of all ten meters totals approximately 275,000 barrels.

For complete details on how you can get similar savings, cut equipment dollars and space needs, contact your representative or write direct.

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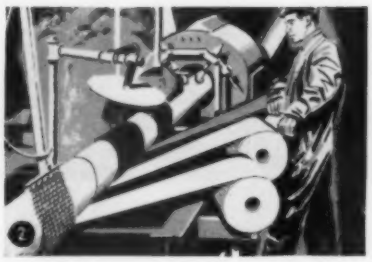
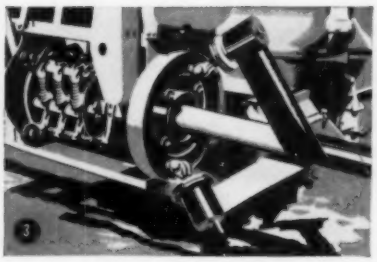
no one coating is best for every job

that's why Dearborn supplies all three





Varying circumstances, job conditions, and even budget limitations prohibit specifying one type of coating for every pipeline. That's why Dearborn offers you all three: asphalt coatings; wax-type coatings; polyethylene plastic tape. These superior coatings, together with the correct primers and wrappers, may be applied at the mill, railhead, by hand or Traveliner. Your local Dearborn representative can help you select the right coating combination for your specific job at lowest possible cost.

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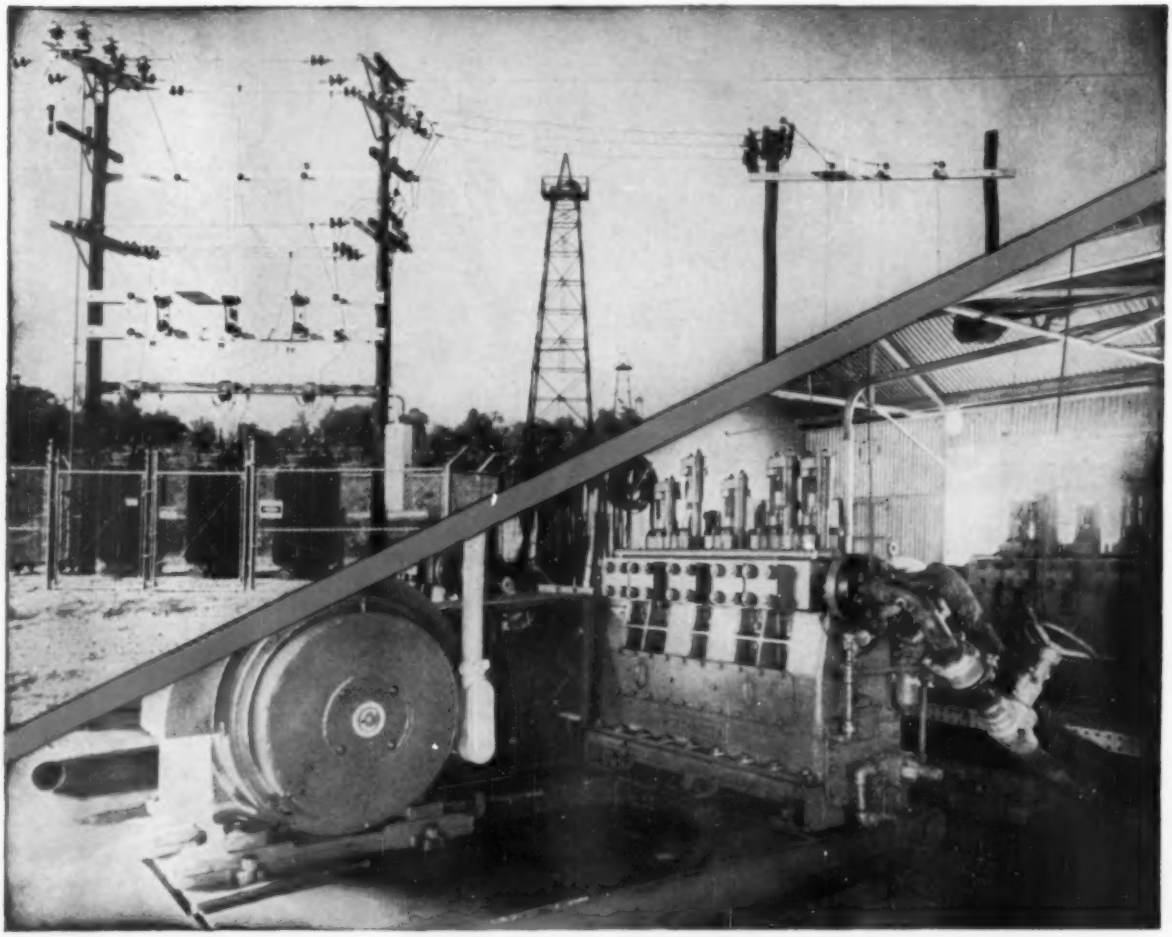
1. Asphalt Coatings. Write for your copy of Bulletin 3083-A.
2. Wax-Type Coatings. Write for your copy of Bulletin 3050.
3. F.O.S. SAFE-T-CLAD Polyethylene Plastic Tape. Write for Bulletin 3002.

Dearborn® CHEMICAL COMPANY

MERCHANDISE MART PLAZA, CHICAGO 54, ILLINOIS

WORLD'S MOST COMPLETE LINE OF PROTECTIVE MATERIALS FOR THE CONTROL OF CORROSION

WATER FLOODING OPERATIONS ARE TURNING MORE AND MORE TO UTILITY ELECTRIC POWER



Progressive Management Finds the Solution

Are you doing water flooding? Do you have plans to do water flooding? If so, don't settle on the power equipment until you have carefully investigated what UTILITY ELECTRIC POWER can do for you. The sales engineer of your Utility Electric Power Company has many actual case records which demonstrate that it is more efficient . . . more economical to use Electric Power. Be modern . . . be progressive . . . enjoy all the benefits of truly automatic, push-button power – Use UTILITY ELECTRIC POWER.

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PETROLEUM ELECTRIC POWER ASSOCIATION

P. O. BOX 35006 DALLAS, TEXAS

DU PONT *Petroleum Chemicals* NEWS

Number 86 in a Series of Bulletins for the Petroleum Industry — APRIL 1958

Knowing what really makes motorists buy HELPS DEALERS SELL

Still another in a series of Du Pont-sponsored surveys has been completed by National Analysts, Inc. The findings are now available in booklet form.

The survey report discloses what emotional reactions influence motorists to choose a service station, a brand of gasoline, a TBA product.

Psychological needs

The psychologists in conducting the study determined that there are four basic needs which can be fulfilled through purchase of service station products and services:

1. **Play**—use of car for recreation
2. **Aggression**—desire for speed and fast acceleration
3. **Conservance**—need to preserve car as an investment
4. **Infavoidance**—the desire of motorists to avoid the *appearance* of inferiority

Specific products

Gasoline sales, as you might suspect, are most influenced by the play and aggression needs. This finding indicates that gasoline advertising should appeal to motorists' desire for recreation and powerful car performance.

It was found that motor oil and grease satisfy the conservance need. The promotion of these products should be directed accordingly. Body polish, which might be thought to satisfy the conservance need, actually gratifies more often the need for infavoidance. So do white sidewall tires.

Anxiety influences

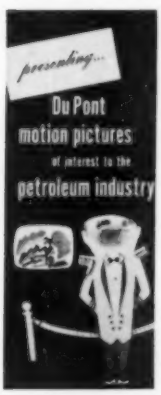
Two of the areas explored were anxieties about product quality and service.

Apparently women drivers are more concerned than men about tire quality and repair. This may be because a flat

Continued – over

Du Pont movies available for oil company showings

During recent years, the Du Pont Company has produced a wide variety of 16 mm sound motion pictures. Several of these are of direct interest to personnel in the oil industry.



Some of these films – such as *It Never Rains Oil* and *What Makes a Gasoline Good* – were made expressly for oil company use by our Petroleum Chemicals Division. There are a number of films also on farming, sports, safety, public relations and various industrial subjects. These films make excellent pro-

Continued – over

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DU PONT *Petroleum Chemicals* NEWS

CONTINUED

New Survey

tire is a greater inconvenience to women.

Women appear to have also a more generalized anxiety over automotive products they buy. This is possibly due to their having, in general, less mechanical knowledge than men.

Perceptions of service stations

Motivational needs lead to motorists' perception of different service stations as places to do business. Perception is influenced also by the opinions of others, including families, and by advertising and promotion of the dealer or the company he represents.

A summary of the findings of the survey are available in book form for easy reference.

CONTINUED

Du Pont Movies

gram material for dealer meetings and showings to customer groups.

Prints are available to oil companies on a loan basis, without charge.

All these Du Pont films are described in a new booklet "Du Pont Motion Pictures of Interest to the Petroleum Industry." The booklet gives information also about requesting the films for your own use. Any of our representatives or sales offices will be glad to send you a copy.

See the
DU PONT SHOW OF THE MONTH
on CBS

THE DU PONT TEL TERMINAL at Beaumont, Texas has complete modern facilities for the storage and handling of TEL, and rapid dispatch of tank cars of it.

Many refiners find pre-mixed additives more convenient

The combination "package" of Du Pont Fuel Oil Additive No. 2 pre-mixed with Du Pont Metal Deactivator has now been available to refiners for a year.

We've heard many favorable comments on this new combination from refiners who have tried it. It has proved a convenience to be able to use a single additive with combined properties that guard against practically all the major chemical causes of heating oil and diesel fuel troubles, specifically sludge and gel accumulations.

The new combination is available to you in drums in two different concentrations . . . FOA-208—92% FOA-2, 8% DMD; and FOA-212—88% FOA-2 and 12% DMD.

Magic Barrel presentation has pierced the iron curtain

Parts of the oil industry's "Magic Barrel" presentation have been recorded and broadcast to people behind the iron and bamboo curtains as well as to those in free countries of the world.

Members of the Voice of America staff first became acquainted with the Du Pont-designed Magic Barrel when visiting the company to develop a special program using the voices of approximately 100 foreign-born and native American Du Pont employees. At this time, the Magic Barrel was shown to the Voice staff to acquaint them with the group of Du Pont products made from oil. They saw in this presentation some of the fruits of American enterprise—presented in a dramatic and convincing fashion. So they asked to have parts of it taped for broadcasting to their listeners.

The Voice of America program is the first concerted effort to tell the story of an American company in many languages.

SALES OFFICES

Chicago 3—8 So. Michigan Ave. . . RAndolph 6-8630
Cleveland 15—25 Prospect Ave. . . SUperior 1-1363
Denver 2—Petroleum Club Building, 16th & Broadway . . . . . AComa 2-2347
Houston 2—705 Bank of Commerce Bldg. . . . . CApitol 5-1151
Los Angeles 17—612 So. Flower St. MAdison 5-1691
New York 20—1270 Ave. of the Americas . . . . . COlumbus 5-2342
Philadelphia 2—3 Penn Center Plaza. LOcust 8-3531
Pittsburgh 22—1 Gateway Center . . . ATlantic 1-2933
San Francisco 4—111 Sutter St. . . . . EXbrook 2-6230
Seattle 3—4003 Aurora Ave. . . . . MElrose 6977
Tulsa 1—1811 So. Baltimore Ave. . . . LUther 5-5578
In Canada—Du Pont Company of Canada (1956) Limited, Petroleum Chemicals, 85 Eglinton Ave. East, **Toronto 12**—Ontario . . . . . HUdson 1-6461
In Other Countries—Organic Chemicals Department, Export Division, 7447 Nemours Bldg., Wilmington 98, Del., OLympia 4-5121, Ext. 2962.

DU PONT
REG. U. S. PAT. OFF.

Better Things for Better Living
. . . through Chemistry

Du Pont Tetraethyl Lead and other Petroleum Additives

OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

A-6647

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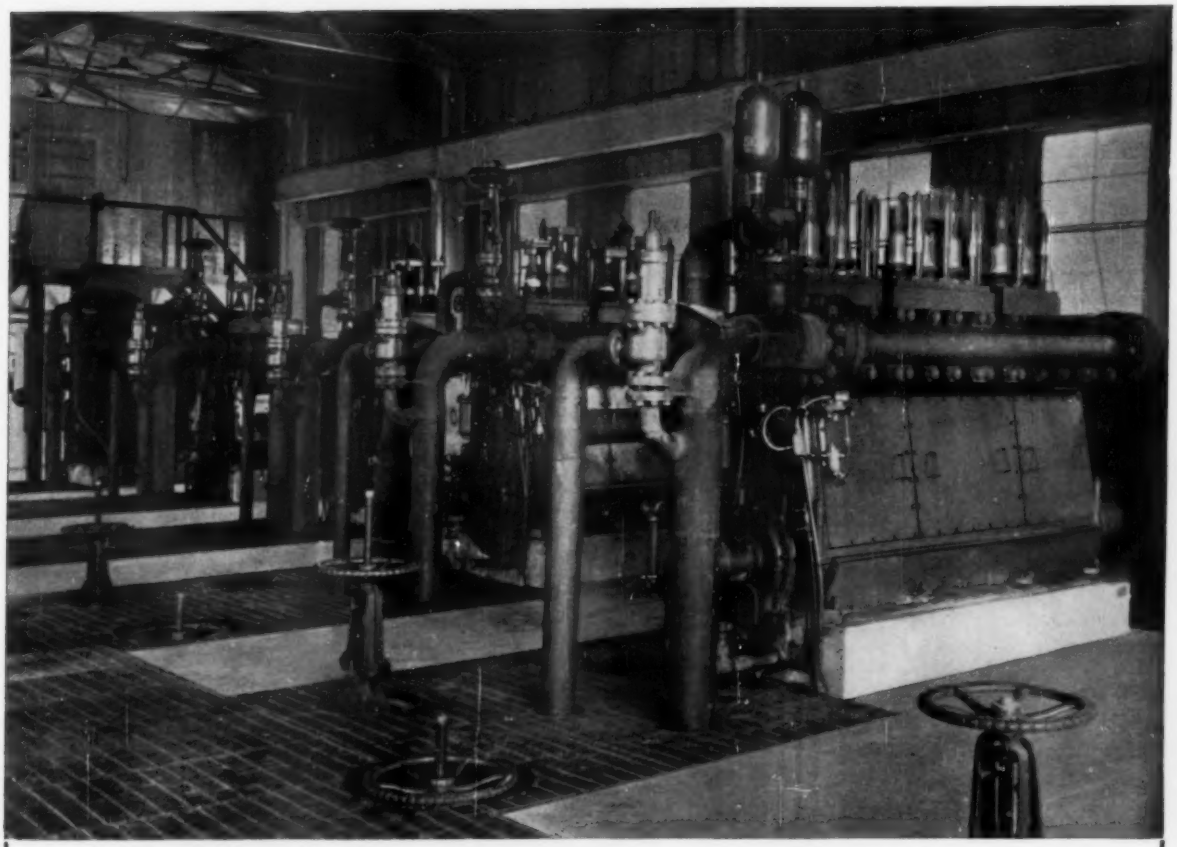


FIELD REPORT

FLOOD: Salem Unit

PUMPS: 10 Aldrich Pumps

2 Variable Stroke, 2 Triplex, 2 Quintuplex, 4 Septuplex

FLOODING STARTED: April 1953

EXPERIENCE TO DATE:

Pumps operating currently under 800 lb pressure, delivering 171,000 bbl a day. Handle mixture of fresh water and oil field brine. Routine maintenance every 4000 hours. Customer reports pump operation and Aldrich field service "satisfactory."

Field parts stock available in Carmi, Ill.; Charleston, W. Va.; Houston; Los Angeles; Odessa and Tulsa. For further information, write the Aldrich Pump Company, 9 Gordon Street, Allentown, Pa.

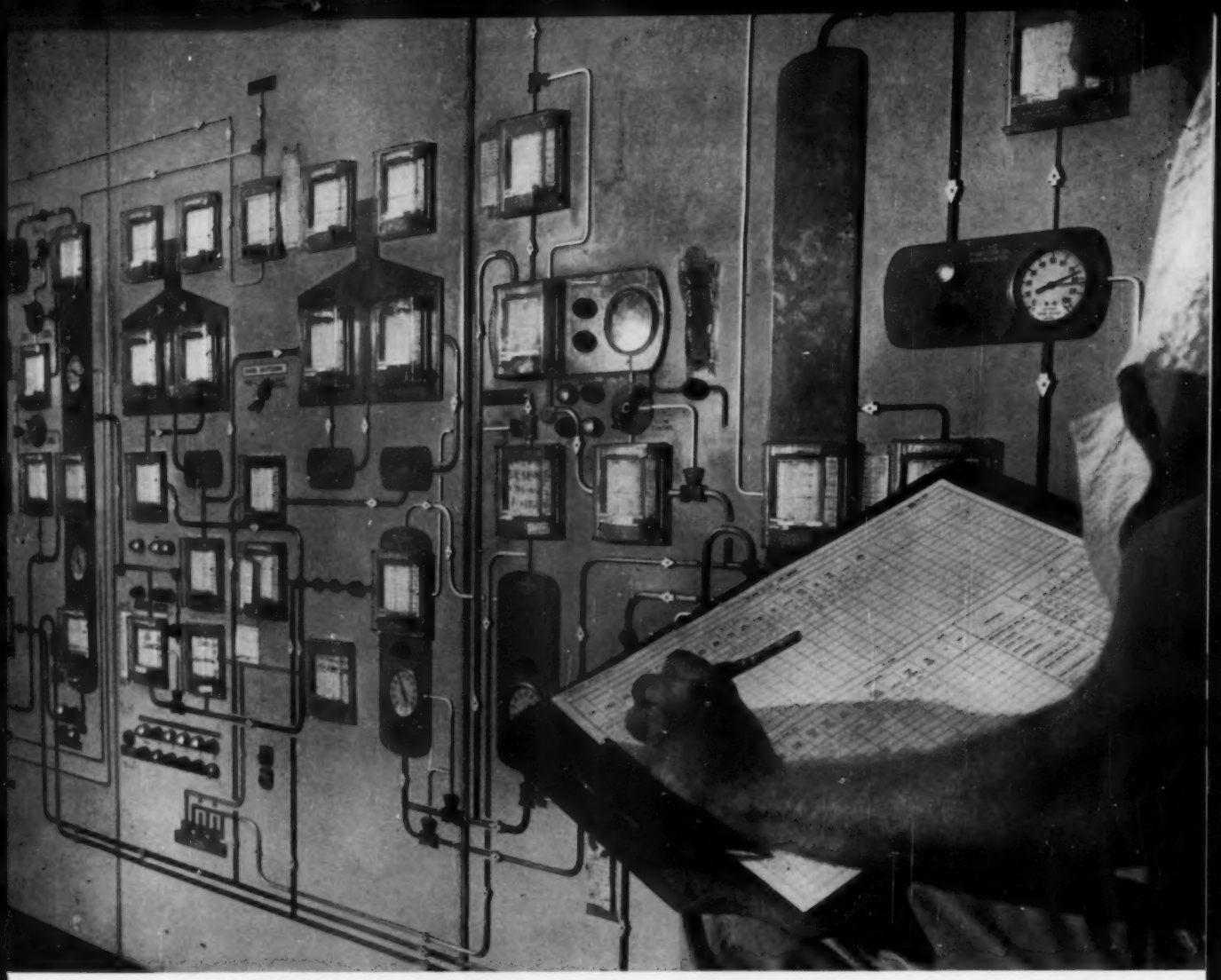
the toughest pumping problems go to ALDRICH

NOTHING **TRANSMITS POWER** WITH THE **FLEXIBILITY** OF ROEBLING ROYAL BLUE WIRE ROPE. This, and its exceptional resistance to abrasion, shock, impact, crushing and fatigue, make Royal Blue the strongest and safest wire rope you've ever used. On any comparative cost basis, nothing matches it as an instrument for transmitting power. For details on the real meaning of long service life, contact your nearby Roebling Distributor, or write Wire Rope Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

DESIGN
FOR WIRE ROPE
Its ready adaptability is evident wherever power is transmitted. It conforms to unique design requirements. Use wire rope to transmit power.



Typical Air-Operated Instrument Panel

To keep down-time down . . .

Come to Kemp

Kemp Oriad Dryer protects compressed air operated control instruments in Seaboard Oil's Powell, Wyoming plant. Dryer, operating 24 hours a day, seven days a week requires only routine maintenance.

A Kemp gas dryer in your operation can put an end to many costly shut-downs by protecting air-operated instruments from corrosion and freezing or jamming . . . efficiently drying inert gases for purging and blanketing . . . or drying atmospheres and process gases in hundreds of other applications. Operations are faster and safer, with better quality control and frequently reduced costs.

And Kemp dryers, operating on the dynamic drying principle, are noted for dependable operation. Rugged Kemp dryers will do your drying job around the clock, month after month, without stoppages or major maintenance. Kemp design reduces utility and operating costs, uses desiccants more efficiently, and eliminates process gas contamination. Units dry to lower dew-points to give your processes and instruments highest possible protection.

Call your Kemp Representative, listed in the Chemical Engineering Catalog, for detailed information and a no-obligation survey of your dryer needs. Or write direct, for Bulletin D-100. The C. M. Kemp Mfg. Co., 405 E. Oliver St., Baltimore 2, Md.

Kemp Convection Dryers

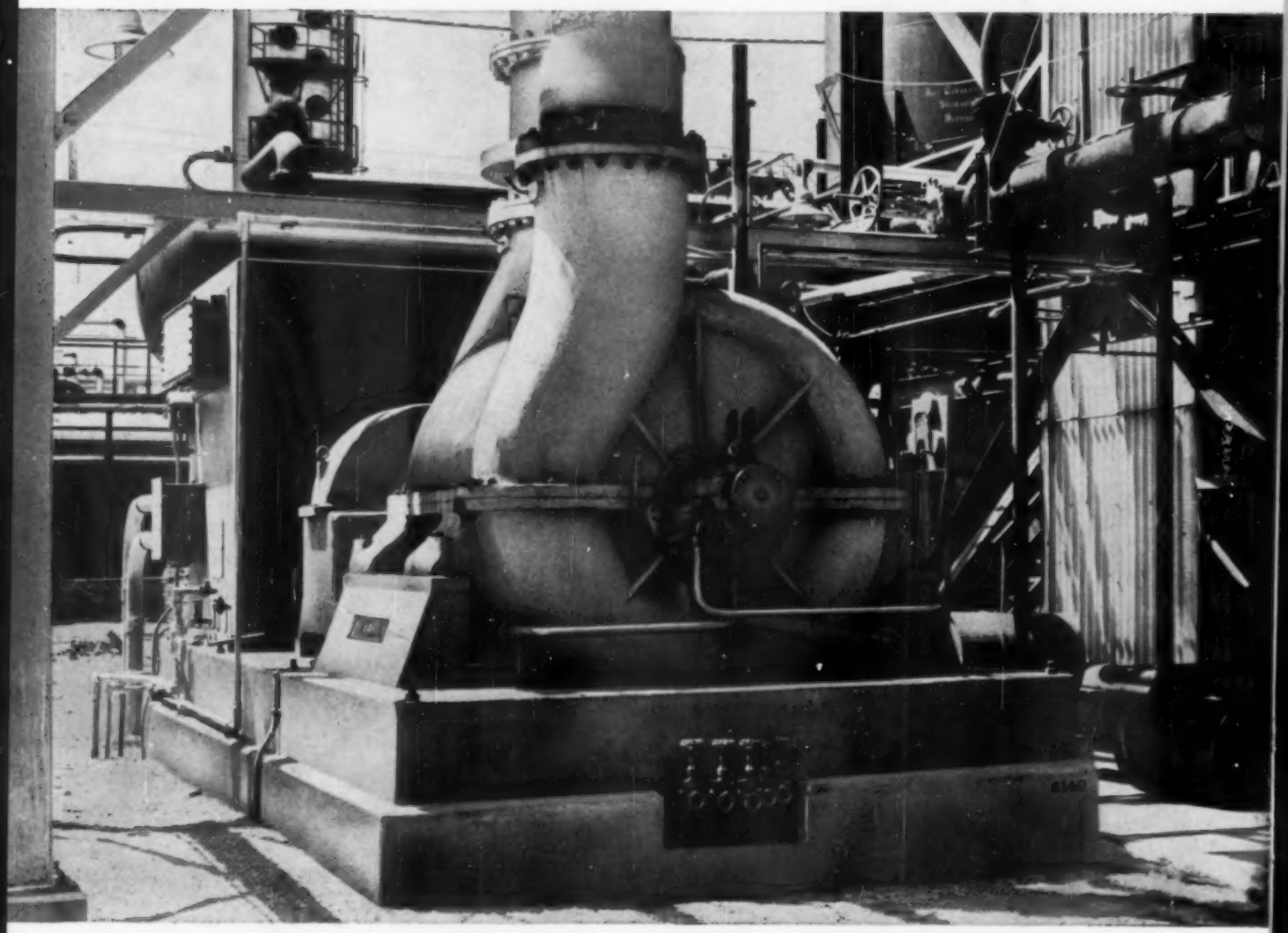
Kemp Inert Gas Generators

KEMP OF BALTIMORE

Kemp Industrial Carburetors

Kemp Oriad Dryers

Another **DE LAVAL** *combustion air compressor dependably serves refinery cat cracker*



On stream at the Coffeyville, Kansas plant of the Cooperative Refinery Association, this De Laval Centrifugal Compressor delivers 24,100 cfm of air. Inlet pressure is 14.0 psia, discharge pressure 38.9 psia. Compressor output is controlled with adjustable inlet guide vanes.

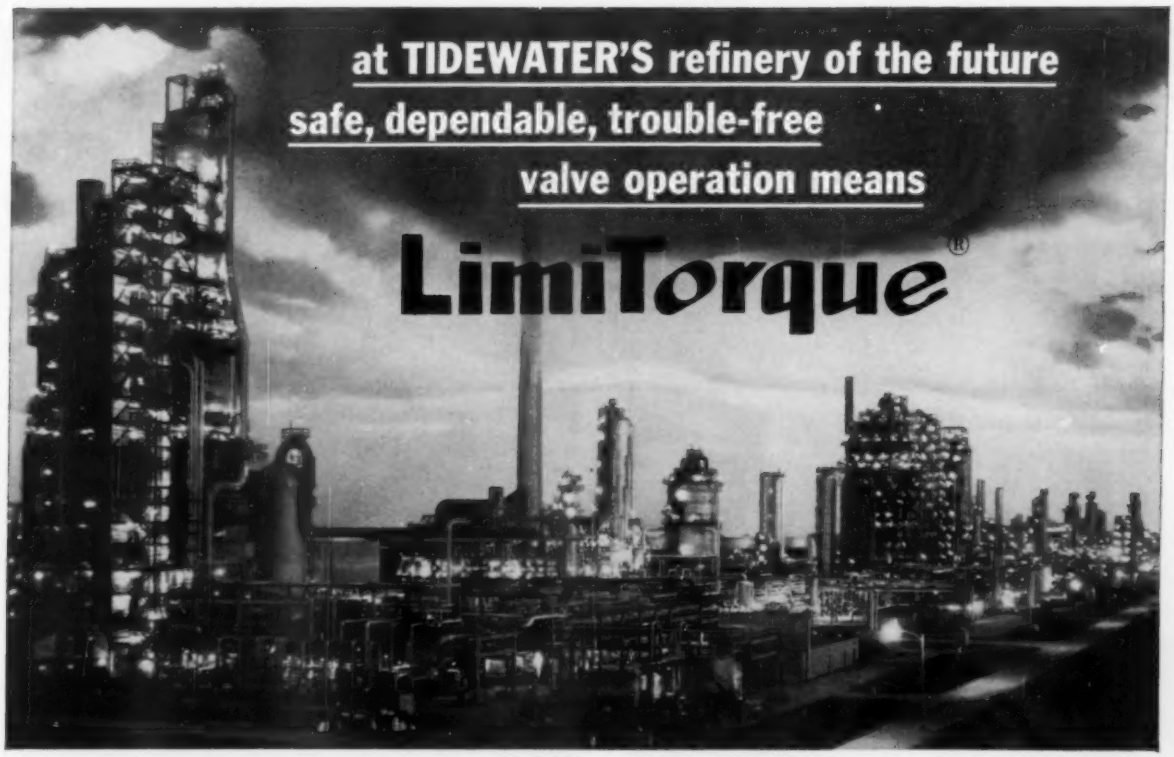
This De Laval main air compressor is driven by a 2500 hp, 1800 rpm motor. Shaft speed is increased to 4800 rpm through a De Laval double helical speed increasing gear.

Cooperative Refinery Association is only one of many refiners who have specified De Laval Compressors. Whether you need to handle light or heavy gases at high or low pressures in catalytic cracking, reforming, alkylation, coking or any similar service, it pays to look to De Laval. Rugged De Laval centrifugal compressors perform dependably in heavy-duty continuous operation. De Laval has more than 40 years of experience in solving gas compression problems.

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY
810 Nottingham Way, Trenton 2, New Jersey

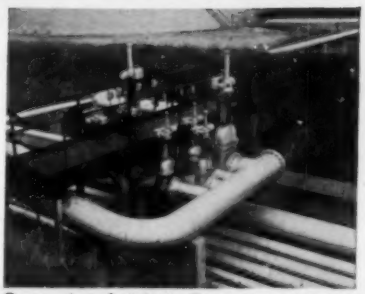
DL 303



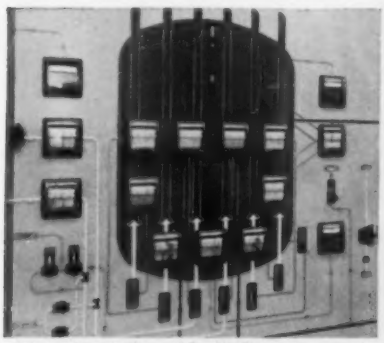
Here, at the World's newest and finest refinery where equipment standards are high . . . technology far advanced . . . six LimiTorque type S3 valve operators at the base of the big "cat", recycle catalysts around the clock . . . help maintain throughput capacity of 102,000 BPD.

In fact, in the refinery section alone 134 LimiTorque Motorized Controls provide safe, automatic, trouble-free valve operation. LimiTorque is more than proud to have played a part in this tribute to American ingenuity.

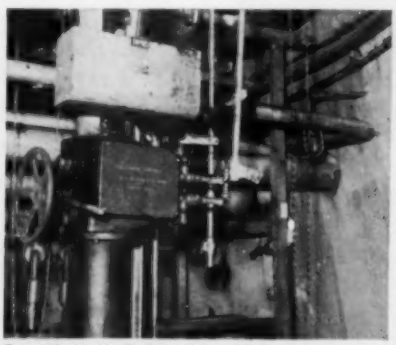
Wherever automatic, remote valve operation is required, LimiTorque will provide rapid, precise control under a wide range of operating conditions. Actuated by electricity, hydraulic pressure, air, or high pressure gas, LimiTorque can be readily field mounted on existing valves. For specific applications, contact your valve manufacturer or nearest LimiTorque representative.



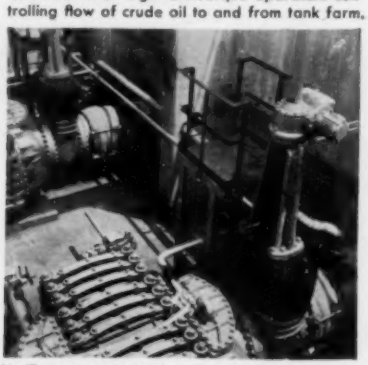
One section of eight LimiTorque operators controlling flow of crude oil to and from tank farm.



Automatic control panel for LimiTorque operated plug valves at base of cat cracker.



One of six LimiTorque S-3 specials regenerating catalysts at base of huge orthoflow fluid cat cracker.



LimiTorque motorized valve controls operate 36 in. valves on ten giant twin strainers.

LimiTorque®

PHILADELPHIA GEAR WORKS, INC.
ERIE AVE. & G STREET. PHILADELPHIA 34, PENNA.
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INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID MIXERS • FLEXIBLE COUPLINGS
Limitorque Corporation • Philadelphia

How 4 big companies cut evaporation loss with "Microballoon"* spheres...

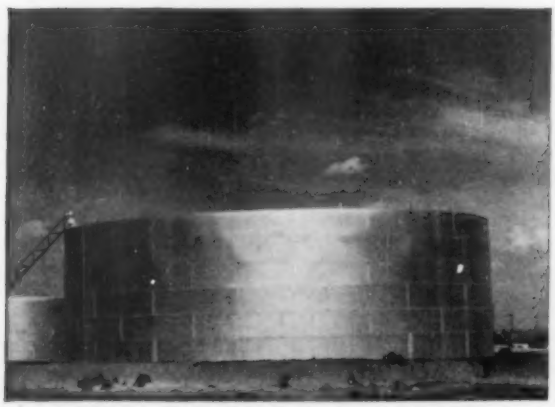
Savings up to

SOHIO—THREE YEARS

of savings have shown the effectiveness of this evaporation control method. The layer of "Microballoon" spheres in each tank on this five-tank farm is still intact. Four tanks have a 7-day cycle with 7 RVP oil. Fifth handles 4 to 5 RVP oil on 23-25-day cycle.

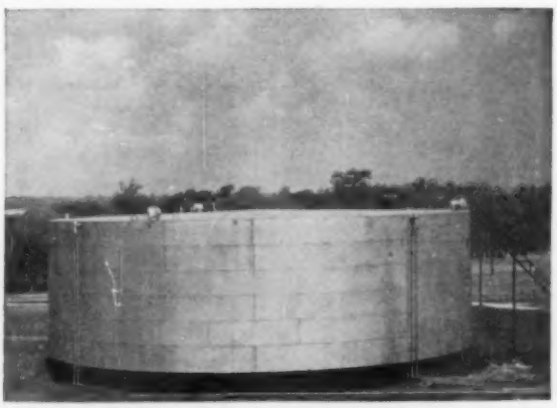
D-X SUNRAY—THREE YEARS

ago a layer of "Microballoon" spheres was installed in this 350,000 bbl. working storage tank. About 6,700,000 bbl. of select crude and mixed crude-casinghead gasoline have been pumped through, with vapor loss cut an estimated 70-80%. Tank is pumping or receiving 80% of the time.



COSDEN—THREE YEARS

after installing 4500 lbs. of "Microballoon" spheres in each of these tanks, an average of 1,500,000 bbl. have been pumped through per year. The foam seal is still at work, stopping evaporation an estimated 75%. Tanks handle sweet crude with high gravity—about 37° to 45° API. Gas content—40 to 50%.



SINCLAIR—THREE YEARS

of service in this cone-roofed tank have shown how much the layer of "Microballoon" spheres can save. A 50 per cent cut in evaporation loss is estimated, and other tanks at the site are due for the same treatment. Tank's average temperature is 75 deg. F., RVP is 5.6 psi.

*Registered trade-mark of The Standard Oil Co. (Ohio)

80%...year after year!

Evaporation loss was cut as much as an estimated 80 per cent for the cone-roofed tanks shown at left. For several years, these tanks have been equipped with a layer of "Microballoon" spheres. These microscopic hollow spheres of BAKELITE Brand Phenolic Resins form a blanket that floats on the surface of crude oil, preventing escape of costly volatiles.

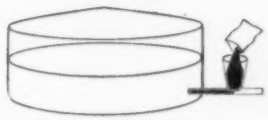
If you are seeking an inexpensive, convenient, quickly-installed method of controlling evaporation loss, these case histories prove that this is a good place to begin. Learn how "Microballoon" spheres made from BAKELITE Phenolic Resins can work for you. Write Dept. BB-128.

FOR EVAPORATION CONTROL

BAKELITE
BRAND
RESINS

UNION CARBIDE

HOW "MICROBALLOON" SPHERES WORK TO CUT EVAPORATION LOSS



1 **"Microballoon" Spheres are mixed with oil being pumped into the tank.**

2 **They immediately start floating to the oil surface, form a blanket in a few hours.**

3 **The blanket seals the entire surface within the tank. This surface seal cuts evaporation loss.**

BAKELITE COMPANY, *Division of Union Carbide Corporation*, 30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario
The terms BAKELITE and UNION CARBIDE are registered trade-marks of UCC.

This Tube is Precision Bored to Rifle Barrel Accuracy

Ashcroft Duragauge in Phenol case – a tough, rigid plastic turret type case for wall or flush mounting.

The Bourdon tube in Ashcroft Duragauges is machined mirror-smooth inside and finish ground outside to exact tolerances. Strong, uniformly thick walls assure precise flexibility–sustained high accuracy and long life.

Eight tube materials permit you to select the best metal with sensitivity balanced by internal corrosion resistance. Whether your choice is phosphor bronze, an alloy steel, "K" Monel, a stainless steel or beryllium copper, metallurgical control is exact from ingot to finished tube. Socket and tip joints are welded or brazed, then stress relieved for highest strength and safety. "Whip testing" at pulsating pressures at least 50% greater than rated pressure insures calibration stability.

Order your Ashcroft Duragauges with the best Bourdon tube material for your service. Choose the all-stainless-steel movement or stainless steel with nylon bearings and pinion gear. Full range of pressures, dial sizes, case designs and materials available. In any combination of components, Duragauges give sustained high accuracy and long service. Get details from your industrial supply distributor.

MAXWELL MANNING M&M & MOORE INC. TRADE MARK

G2-58

ASHCROFT PRESSURE GAUGES

A product of

MANNING, MAXWELL & MOORE, INC.

Consolidated Ashcroft Hancock Division • Stratford, Connecticut

In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

Wheatland Steel Pipe . . . for

DURABILITY

Talk about durability! On July 8, 1889, John L. Sullivan went 75 rounds with Jake Kilrain before he finally won the heavyweight championship of the world. This was the last bare-knuckle title fight.

. . . pipe with the yearmark!

You can be sure of long, trouble-free service when the steel pipe you specify bears the mark "Wheatland—58." This is the pipe built by specialists to meet the most rigid tests of endurance. It's the pipe with the "look of quality" and performance to back it up.

API LINE PIPE IN ACCORDANCE WITH AMERICAN PETROLEUM INSTITUTE SPECIFICATIONS

For information about Black or Galvanized Steel Pipe, contact:

WHEATLAND TUBE CO.

BANKERS SECURITIES BUILDING, PHILA. 7, PA. • MILLS: WHEATLAND, PA. • DELAIR, N.J.

Men like EDDIE HULL make the difference!

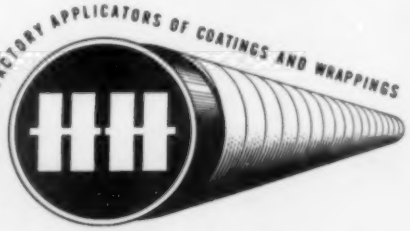
Meet your best guarantee of Hill-Hubbell quality! His name is Eddie Hull, one of the hundreds of factory-trained craftsmen who make the Hill-Hubbell name synonymous with quality in the pipe coating and wrapping field!

It's easy to see that Eddie takes pride in a job well done! That's why Eddie and the men like him are the most valuable asset that Hill-Hubbell has! So, for skilled, conscientious craftsmanship in permanent factories where every operation is controlled—

Specify Hill, Hubbell wrapped pipe on your next job

HILL·HUBBELL & COMPANY

DIVISION OF GENERAL PAINT CORP. • 3691 MAYFIELD ROAD, CLEVELAND 18, OHIO



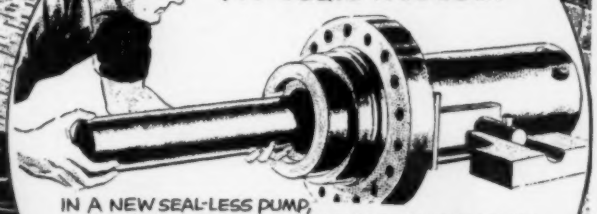
FIELD FACTS

THE METAL THAT ACTS LIKE AIR

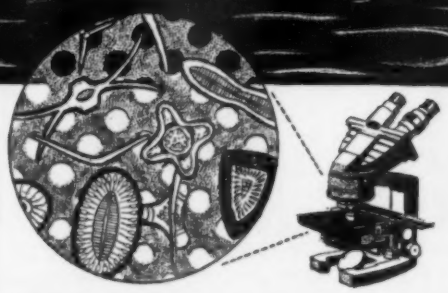
...helps driller hit 50-foot bull's-eye in longest (2.7 mile) directional hole!

LONGEST DIRECTIONAL HOLE WAS BOTTOMED 14,128 FEET UNDER HOUMA, LOUISIANA... 3,340 FEET AWAY FROM RIG. DRILLERS USED A "K" MONEL* AGE-HARDENABLE NICKEL-COPPER ALLOY COLLAR TO KEEP WITHIN 25 FEET OF PLANNED AXIS ALL THE WAY DOWN. "K" MONEL ALLOY IS NON-MAGNETIC. IN DRILL COLLARS IT ACTS AS AN AIR GAP... ISOLATES SURVEY RECORDING INSTRUMENTS FROM MAGNETIC INFLUENCES OF STRING, HELPS ASSURE TRUE DIRECTION.

Motor goes inside pump housing... *No seals needed!*



IN A NEW SEAL-LESS PUMP, MOTOR AND PUMP ARE COMBINED WITHIN THE SAME HOUSING. THE STATOR IS ISOLATED FROM PUMPED FLUID BY AN INCONEL* NICKEL-CHROMIUM ALLOY "SHEATH"; ROTOR BY AN INCONEL ALLOY "CAN". BECAUSE INCONEL ALLOY IS NON-MAGNETIC, THE MAGNETIC FORCE GOES RIGHT THROUGH BOTH "SHEATH" AND "CAN" TO DRIVE ROTOR WITHOUT SIGNIFICANT LOSS IN MOTOR EFFICIENCY.



0.000001-inch skeletons too "fat" to go through metal filter!

PORES IN METAL DISK OF SINTERED POWDERED METAL FILTER ARE SO TINY THAT 1-MICRON-SIZED SKELETONS OF DIATOMS (SINGLE-CELLED MICROSCOPIC, MARINE PLANTS) CAN'T BE SQUEEZED THROUGH. WHEN MADE OF POWDERED NICKEL OR STAINLESS STEEL, THESE "SOLID LOOKING" METAL FILTERS ARE ESPECIALLY USEFUL IN STRIPPING SMALL PARTICLES (POWDERED CATALYSTS, FOR EXAMPLE) FROM LIQUIDS WHEN TEMPERATURES, PRESSURES OR CORROSION ARE HIGH.

STUMPED BY A METAL PROBLEM?

A CHAT WITH INCO'S MECHANICAL OR CORROSION ENGINEERING SECTION MAY HELP. FOR DETAILED INFORMATION ON INCO NICKEL ALLOYS IN OIL PRODUCTION USES, WRITE FOR "METALS TO MAKE PETROLEUM PRODUCTION EQUIPMENT PRODUCE MORE".

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street New York 5, N. Y.

INCO

*Registered trademark

INCO NICKEL ALLOYS

POWELL

world's largest family of valves

Fig. 512—Small Bronze Gate Valve for 150 pounds W.S.P. Inside screw non-rising stem. Solid wedge disc. Can also be supplied with flanged ends.

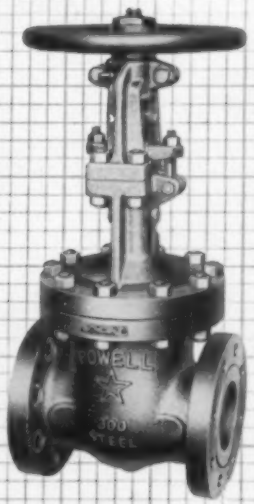


Fig. 3003—Steel Gate Valve for 300 pounds W.S.P. Outside screw rising stem and yoke. Solid wedge Disc, screwed-in seat rings. These valves also available for 150 pounds and higher pressures.

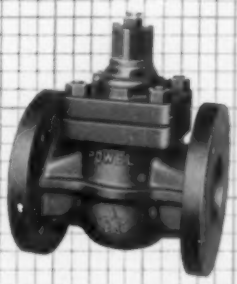


Fig. 2201—Semi-steel Lubricated Plug Valve for 175 pounds W.O.G. Single gland type. Sizes 1" to 4". Can be supplied with screwed ends. Other types and higher pressure valves are available.

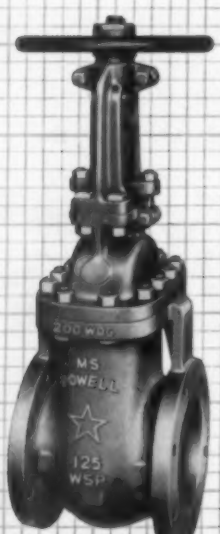


Fig. 1793—Large Iron Body Bronze Mounted Gate Valve for 125 pounds W.S.P. Outside screw rising stem and yoke. Solid wedge disc.

Fig. 1561A—New Steel Swing Check Valve for 150 pounds W.S.P. When disc is in wide open position straight, unobstructed flow area through the valve is provided.

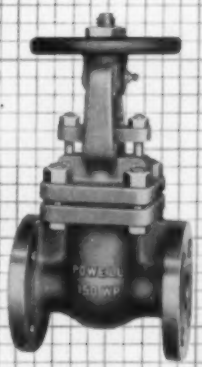


Fig. 2491—Small Stainless Steel Gate Valve for 150 pounds W.P. Outside screw rising stem and yoke, solid wedge disc. Can be supplied with interchangeable double wedge discs. Available also with screwed ends.

NO MATTER WHAT your flow control requirements, Powell offers more kinds or types of valves, available in the largest variety of metals and alloys. Powell distributors, located in all principal cities, maintain inventories to fill almost any need. For special engineering problems, write direct to:

THE WM. POWELL COMPANY • *Dependable Valves Since 1846* • **Cincinnati 22, Ohio**

For economical pumping choose from these Bethlehem rods

These four types of Bethlehem sucker rods will handle a wide range of pumping conditions. Each rod is carefully made and thoroughly inspected, and can be counted on to keep strings in the hole for long periods of time. If you have any question about the use of these rods, or about Bethlehem's full line of sucker rod accessories, get in touch with your Bethlehem sucker-rod distributor. Or, if you prefer, the nearest Bethlehem sales office will gladly give you full details.

ROD	TYPE	HEAT TREATMENT	YIELD POINT psi		TENSILE STRENGTH psi	
			Min.	Av.	Min.	Av.
X 2	Carbon-manganese	Normalized	65,000	72,000	93,000	100,000
X Mayari	Nickel-chromium	Normalized	60,000	65,000	88,000	95,000
46	Nickel-molybdenum	Normalized and tempered	67,000	75,000	82,000	90,000
43	Nickel-chromium-molybdenum	Normalized and tempered	100,000	110,000	120,000	130,000

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

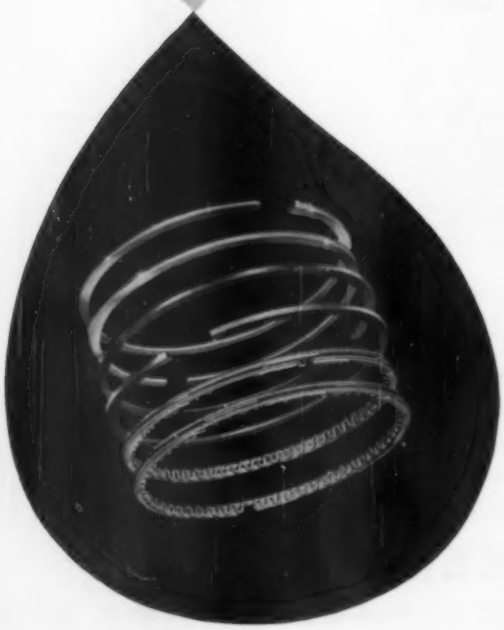
BETHLEHEM STEEL

BETHLEHEM STEEL

why "Precisioneered"

PEDRICK PISTON RING SETS

Improve Diesel and Gas Engine Performance!



PEDRICK Piston Ring Sets for diesel and gas engines are "precisioneered" to assure maximum power with minimum oil consumption, to most effectively seal against blow-by, to deliver the greatest number of hours of efficient performance at lowest operational and maintenance costs.

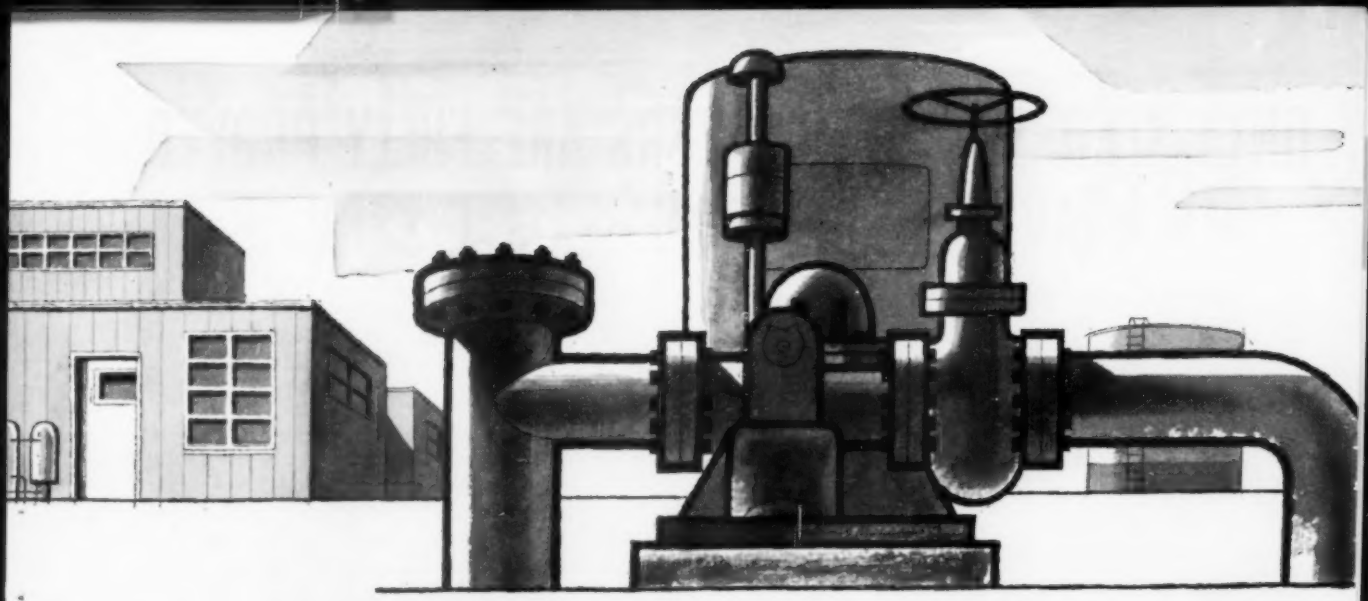
The rings in a PEDRICK "Precisioneered" Set are individually designed to assure users coordinated *team* action. The assembled set is tailor-made for *unitized* action in the specific engine.

That's why PEDRICK Engineered Sets are used as original equipment in practically all leading heavy-duty diesel and gas engines . . . and why when replacement rings are installed, PEDRICK Engineered Sets are specified by most maintenance men.

Complete Sets . . . or open-stock rings, you get improved performance, more economical operation when you specify PEDRICK Piston Rings. And remember, if you have any kind of a ring problem, you can count on us to help you solve it. Write, wire or phone: WILKENING MANUFACTURING COMPANY, Philadelphia 42, Pa. SAratoga 9-3770. In Canada: Wilkening Manufacturing Co. (Canada) Ltd., Toronto 2.

Pedrick PISTON RINGS

PEDRICK PIONEERED Conformable RINGS FOR BIG BORE ENGINES



New PACKAGED Pipeline Control System cannot tell a lie!

SEE IT AT BOOTH 75, 76, 77
PIEA CONFERENCE
Dallas, Texas
April 29, 30, May 1

Designed by the pipeline industry for the pipeline industry

For years, now, Union Switch & Signal has been designing custom control systems to solve individual problems for pipeline companies. Out of this experience has come a realization of your requirements and the need for a simple *standardized* system capable of easy expansion . . . with the lower cost advantages of package design being passed on to you. That system is now available.

This new modular C.T.C. System concentrates all apparatus for the supervisory control of a station on two 19″-wide racks. One rack goes in the controlling office, the other goes at the field location being controlled. It provides display of indications and alarms and can easily be adapted to handle telemetering and other data. Future additions or changes to the system can be made without changing the basic circuits.

Security as well as conventional reliability

Rugged, industrial-type control components—designed and built by Union Switch & Signal itself—give this system the reliability you need in pipeline operation. But it goes further than mere reliability. Like other UNION C.T.C. Systems, this new system *checks itself* for error before implementing a control.

It is coded so that noise or distortion cannot operate the field equipment. It checks this code to insure correct operation. It immediately gives an indication if a power failure occurs at any time.

This is the system you need to insure fail-safe operation. It is the system you need to trim the cost of single station controls. See it demonstrated at the PIEA Conference in Dallas. And watch for future standardized systems now being developed by Union Switch & Signal.

UNION SWITCH & SIGNAL
DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY
PITTSBURGH 18, PENNSYLVANIA

ONLY SIKORSKY HELICOPTERS ARE FULLY PROVED IN HEAVY-PAYLOAD COMMERCIAL SERVICE

PUBLIC UTILITIES such as Southern California Edison Co. and Pacific Gas and Electric Co. have used Sikorsky S-58s to airlift steel, concrete and other equipment for construction of power transmission towers and distribution lines in almost inaccessible areas. Above, an S-58 positions a distribution line pole in the Santa Ynez mountains of California.

Only Sikorsky helicopters have proved their versatility and dependability with years of heavy-payload commercial service.

Shuttling two-ton loads of vital cargo speedily and efficiently to strategic but isolated sites . . . carrying more than 230,000 passengers yearly to and from offshore drilling rigs . . . eliminating costly and time-wasting road building through jungles or mountains . . . Sikorsky S-58s and S-55s are doing the man-sized jobs. Performance specifications are endorsed by years of real commercial service, and are not based on theory or demonstrations alone.

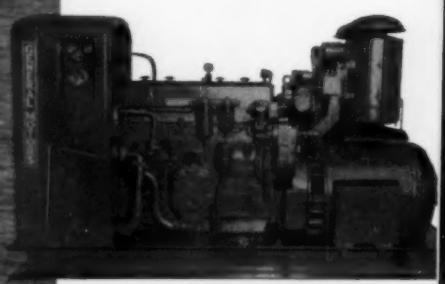
If your project takes you into jungles, the Arctic, offshore or to any other hard-to-reach areas where transportation is a costly problem, rugged Sikorskys can give your operation new flexibility and new efficiency. Write for complete information.

OIL COMPANIES operating offshore and in remote areas use only Sikorskys for big and demanding jobs. In the New Guinea jungle, for instance, S-58s are transporting crews, sectionalized rigs, machinery and everything needed for construction and operation of well drilling rigs. Here an S-58 carries a mud tank weighing over two tons.

SIKORSKY AIRCRAFT
STRATFORD, CONNECTICUT
One of the Divisions of United Aircraft Corporation

DEPENDABLE POWER

This is the CATC Group platform and Nicklos Brothers Drilling Company rig operating offshore from Louisiana in the Empire area. This is the same rig used to drill recently in 112 feet of water.



One of three 100 KW Stewart & Stevenson generator sets being used on the drilling operation by the Nicklos Drilling Company.

In Big Offshore Chore, No Maintenance Costs

Everything has to be right on the CATC Group platform which is in deep water in the Gulf of Mexico. The drillsite is far from land. The wells are being drilled deep . . . and directionally.

One of the RIGHT things about the Nicklos Drilling Company rig is the AC power that comes from three 100 KW, Stewart & Stevenson GM Diesel powered generator sets.

"These have been extremly satisfactory," Don E. McMahon, President of the Nicklos Drilling Company, says.

"The sets have been in operation over a year and we have had no maintenance costs."

When power needs are critical . . . when power must be precise and dependable, you can be sure of Stewart & Stevenson, the world's largest distributor of diesel engines.

The right power and the best service and parts policy make for unexcelled dependability.

STEWART & STEVENSON

STEWART & STEVENSON SERVICES, Inc.

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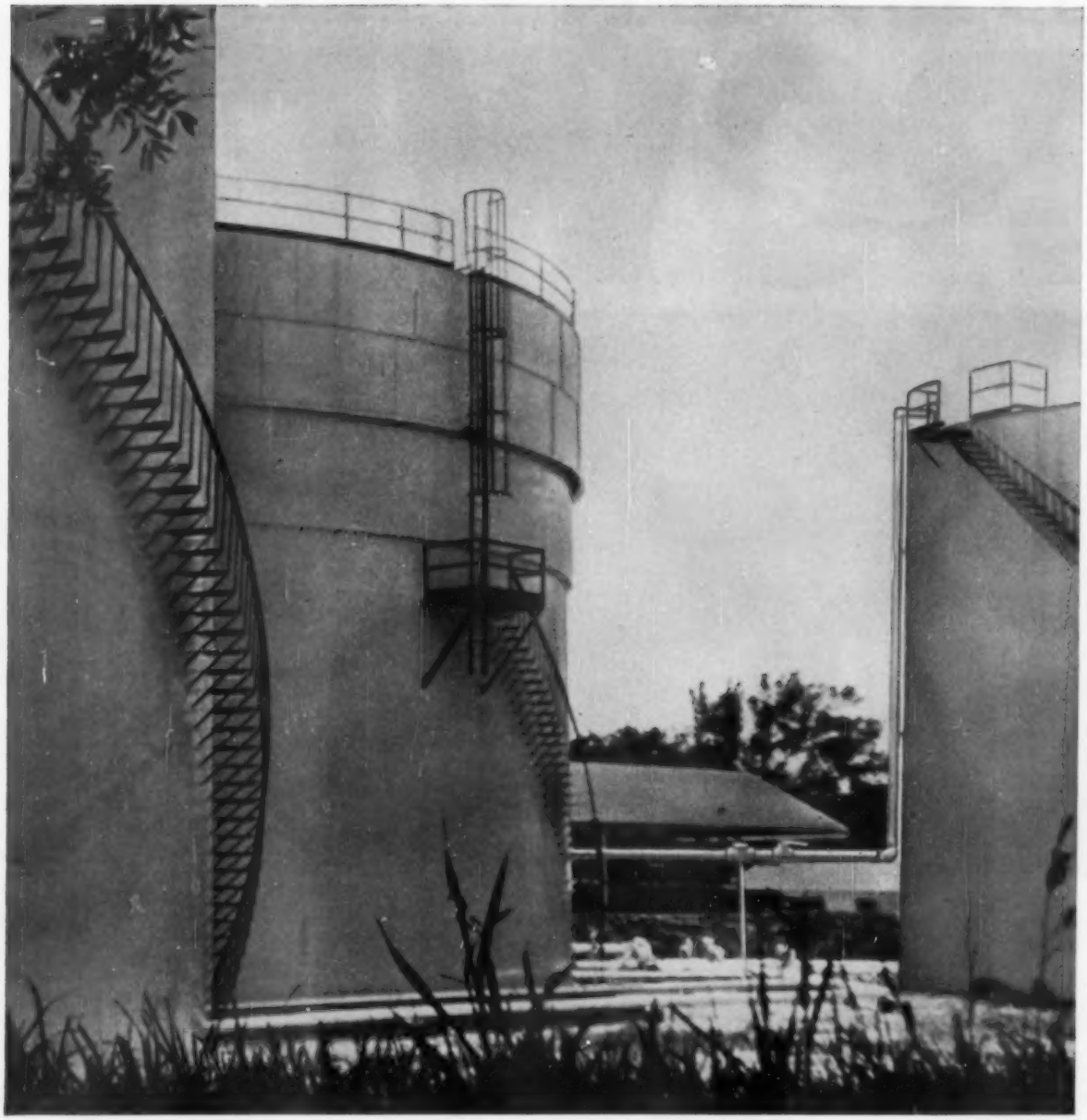
We're proud of our record in meeting every power need for the nation's leading drilling contractors

THE WORLD'S LARGEST DISTRIBUTOR OF DIESEL ENGINES



MOTHER HEN TO TERMINAL PROFITS!

The Graver Expansion Roof® Tank, here nestled among adjacent manifolded cone roof tanks, is standing guard over precious vapors. This famous mother hen of the terminal virtually breathes profits back into the gasoline it protects by taking charge of the vapors generated in the other tanks and returning them to the product. With volatility and fire power maintained, distribution of a uniform product can always be assured. A Graver Expansion Roof Tank manifolded to a battery of quality Graver cone roof tanks represents the most profitable investment you can make in product terminal tankage. May we show you why?

GRAVER®

Building for the Future on a Century of Craftsmanship in Steels and Alloys

GRAVER TANK & MFG. CO., INC.

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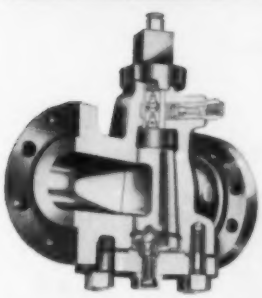
Tulsa • Sand Springs, Oklahoma • Houston • New Orleans
Los Angeles • Fontana, California • San Francisco

QUALITY SPEAKS IN ANY LANGUAGE



Rockwell-Nordstrom **Christmas Tree valves "top" wells from Saudi Arabia to Sweetwater, Texas—wherever oil and gas are produced, in any language, the name Rockwell-Nordstrom means quality.**

The combination of pressure and abrasion at the wellhead are a tough test for any valve. In Rockwell-Nordstrom valves, vital seating surfaces are *never* exposed to high well pressure and abrasive fluids. That's why they stay in service year after year on even the toughest wells. And shut-off is completely positive because *pressurized lubricant* forms a leak-proof seal between the solid tapered plug and the valve body. Lubricant does another important job, too. Acting as a hydraulic jack, the lubricant can minutely unseat the plug to insure instant operation even after years in an open or closed position.

See your supplier today. He'll tell you why Rockwell-Nordstrom valves will save you money and give you better control on any wellhead service. Available in the world's most complete line of lubricated plug valve sizes and pressures. Rockwell Manufacturing Company, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-Nordstrom VALVES

it's **ROCKWELL**

MANUFACTURING COMPANY

Seeing is believing . . .

MUD WEIGHT

controlled best in muds by **BAROID***

The best mud weight for your well is more than a density figure.

The minimum safe mud weight is based on the pressures encountered and the nature of the formation.

Maintenance of any given mud weight also involves control of viscosity, gel strength and filtration properties.

Specify BAROID and use our know-how for maximum performance at minimum cost.

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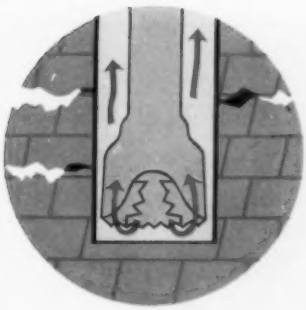
B 5824

MUD WEIGHT LOW ENOUGH TO...

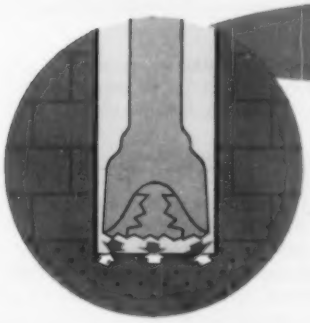
KEEP COSTS DOWN

GET FASTER DRILLING

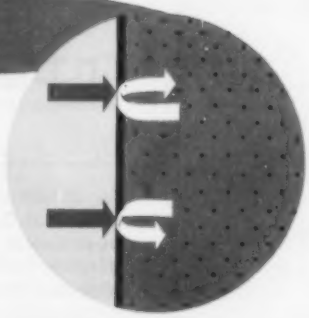


MAINTAIN CIRCULATION

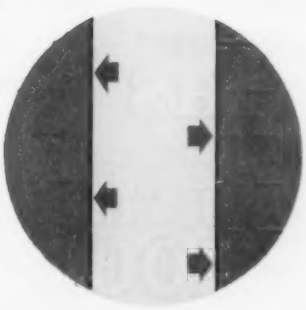
MUD WEIGHT HIGH ENOUGH TO...



PREVENT BLOWOUTS



HOLD BACK SALT WATER



KEEP FORMATION IN PLACE

B 5824

10 ways to protect the quality of your petroleum products

THE UOP FAMILY OF SUPERIOR ADDITIVES AND INHIBITORS SERVING THE PETROLEUM INDUSTRY

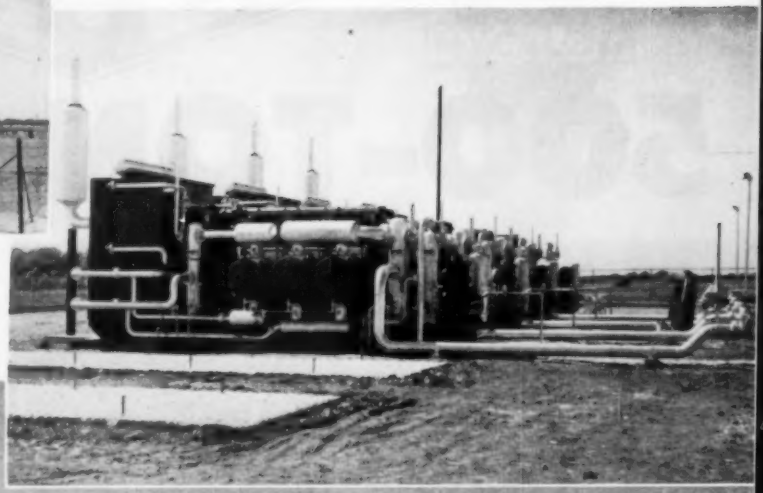
PRODUCT	APPLICATION
UOP NO. 1* Inhibitor, a phenolic fraction obtained from wood distillation.	Most economical way of obtaining antioxidant units.
UOP NO. 4* Inhibitor, a substituted aminophenol.	Protects unstable gasolines; potent for reducing copper dish gum.
UOP NO. 5* Inhibitor, N, N'-di-secondary butyl-p-phenylene-diamine.	Prevents gum formation and stabilizes tetraethyl lead; catalyzes air oxidation of mercaptans.
UOP NO. 5S* Inhibitor, phenylene-diamine type antioxidant.	Similar to No. 5 but catalyzes sweetening at a sharply increased rate.
UOP NO. 7* Inhibitor, crystalline dibutyl para cresol.	Inhibitor for relatively stable gasolines; stabilizes lead, insoluble in acid or alkaline tank bottoms.
UOP NO. S-7* a 33⅓% solution of UOP No. 7 in toluene.	Improved convenient form of No. 7 for liquid injection into gasoline.
COPPER DEACTIVATORS Regular Grade—80% active ingredient. AW* (50) Grade—50% active ingredient.	Prevents traces of copper from interfering with the action of the above inhibitors. Synergist for fuel oil inhibitors and dispersants.
UNICOR® ash-free, low nitrogen, oil-soluble corrosion inhibitor.	Protects refinery equipment, storage tanks and pipe lines from corrosion. Active over wide pH range.
UNICOR® LHS anti-icer and corrosion inhibitor.	When added to gasoline it eliminates stalling caused by carburetor ice. An excellent corrosion inhibitor for all distillate streams; particularly useful in liquid propane and butane.
POLYFLO* 100 an all-organic inhibitor-dispersant.	For all fuels and diesel oils: 1) To improve jet fuel thermal stability. 2) To stabilize No. 2 heating oils and diesel fuels against color deterioration and sludge deposition. 3) To eliminate fouling in feed exchangers and reboilers. 4) To eliminate tank bottoms in crude and residual oil storage tanks.

You're always sure of best quality, best performance when the additives and inhibitors you use are labelled "UOP"

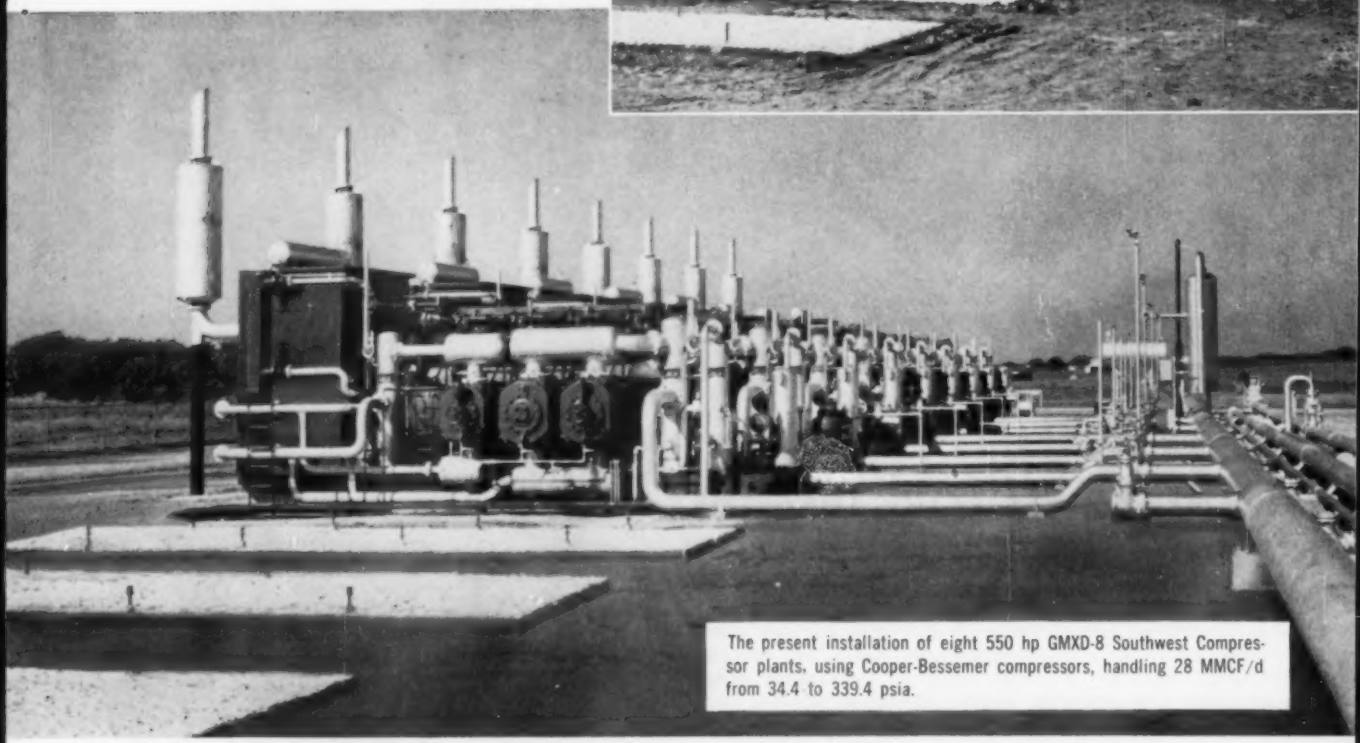
*Trade Mark

UNIVERSAL OIL PRODUCTS COMPANY
30 Algonquin Road, Des Plaines, Illinois, U.S.A.

GROWING...



GROWING...



The present installation of eight 550 hp GMXD-8 Southwest Compressor plants, using Cooper-Bessemer compressors, handling 28 MMCF/d from 34.4 to 339.4 psia.

AND STILL ROOM TO GROW

With Southwest compressor plants you have the exact horsepower you need when you need it. The photographs show the various stages in growth of the Continental Oil Co. Plant, West Short Junction Field, Oklahoma. It has grown in size as the need for increased compressing capacity has grown. It can continue to grow with no obsolesence, no major changes. Additional Southwest Compressor plants are added as required.

Southwest, code constructed compressor plants are fully factory assembled. They are mounted on heavy duty skid bases with cooling, air starting, lubricating, and automatic control systems installed. They are ready for installation months before conventional units. Because of the automatic controls and safety devices, operating costs per horsepower-hour are cut to a fraction of the costs of a fully attended installation. Ask Southwest engineers to consult with you on your compressing plant requirements. Available in sizes from 265 to 880 hp.

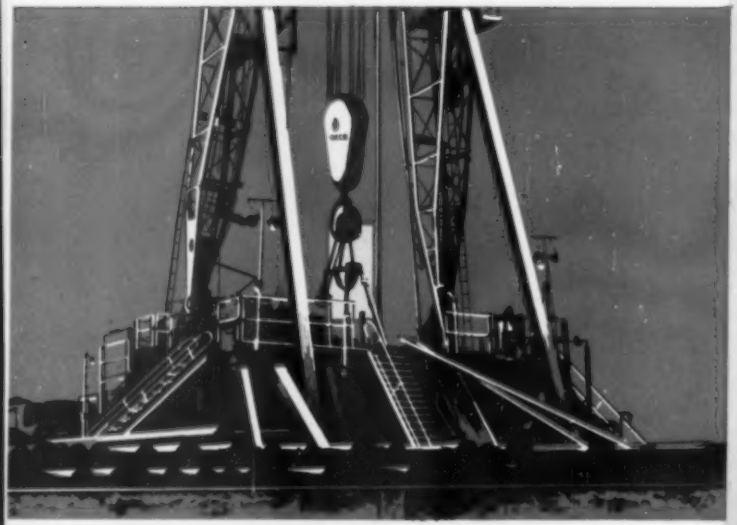
SOUTHWEST INDUSTRIES, INC.

P. O. Box 19392, Houston 24, Texas

ANNOUNCING THE *NEW* IDECO

TRU-LINE

500-TON SWIVEL



ENGINEERED BALANCE AND TRUE ALIGNMENT GIVES EXTRA LONG LIFE

Timken heavy-duty tapered roller main bearing gives capacity beyond today's deepest drilling needs.

Good looking swivel, isn't it? The inside story is equally impressive. Only Ideco has all these advanced features: Rapid hose coupling, Kwik-Change "Floating" washpipe assembly, four-bearing design with adjustable clearance main bearing, streamlined all-steel body, low center of gravity. Write for complete information.

KWIK-CHANGE FLOATING WASHPIPE ASSEMBLY REMOVED WITH GOOSENECK AND HOSE IN PLACE

Kwik-Change assembly is easily removed from under the bonnet by unscrewing retainer caps at top and bottom of unit. With the assembly removed, packing and washpipe can be quickly replaced without the use of special tools. Field-proved Floating Washpipe is mounted on Fleximount rubber ring, assuring constant alignment with packing.

When only the BEST will do...use **IDECO**

ONE OF THE DRILLING INDUSTRIES

P. O. BOX 1331
DALLAS 21, TEXAS

They Say—

Rank wildcat rankles reader

Dear Sir:

This note concerns a minor problem of rank. Not, in this case, who outranks whom, but the use of the word as an adjective in your columns. Like others, no doubt, I had grown accustomed to reading of "rank wildcats" and made the tacit assumption that "rank," in this content, meant "complete" or "absolute."

Recently, though, I read of a "rank discovery" or two, and wondered how they differed from other discoveries which might be less complete or absolute. I manfully struggled from my chair and made my way to a Webster's Unabridged. I came back with the following impressive list of synonyms for rank: proud, haughty, mighty, headlong, luxuriant in growth (as of weeds), indecent, offensive, rancid, lustful, abundant, flagrant.

Now the possibilities here for plays on words, relative to applying the word "rank" to wildcat, are so overwhelming that my mind reels: proud, indeed, if the wildcat racked up a discovery; offensive, of course, if it was on land we tried to lease and couldn't; and so on. However, since I doubt that you seek to emphasize either drama or hurt feelings in describing a wildcat I am perplexed.

In any event, I felt that your desire for accuracy in science also extends to semantics. If so, just what kind of wildcats and discoveries are these?

Robert H. Paschall
Ventura, Calif.

Editor's note: "Rank" got into exploration reporting through another definition: "That which is extremely, utterly, or violently what it is declared to be." It has rankled us too. The Journal tries to use "remote" as the best substitute, but "rank" still slips in occasionally.

Shove in right direction

Dear Sir:

Just saw the March 17 Journal and I want you to know how much I enjoyed Dr. Gardner's treatment of "The Letter" ("A Professor Comments . . . and An Editor Replies," OGJ, Mar. 17, p. 227).

I'm afraid that most of your comments concerning professional behavior are true. This is, of course, a painful admission since I appear to be the "type specimen" of professor—

HYCALOG

2 HYCALOG 8 3/8" DIAMOND BITS DRILL 2538' IN 473 HOURS PUMPING 14,012,000 GALLONS OF MUD AT 430 TO 560 GPM ON 10,500' OFFSHORE WELL

This record, probably never before approached by any type of bit, saved an estimated 10 trips, with corresponding enormous savings in expensive offshore rig time.

These two bits, engineered specifically for the drilling conditions, were delivered within 36 hours. HYCALOG was given specifications of the pump and flow system and desired return annulus velocity. This permitted production of bits which would keep their cutting surfaces flushed at all times . . . and which would not be eroded away before the anticipated footage had been drilled.

Ask your HYCALOG *representative for information . . . or write us direct.*

Hycalog, Inc.

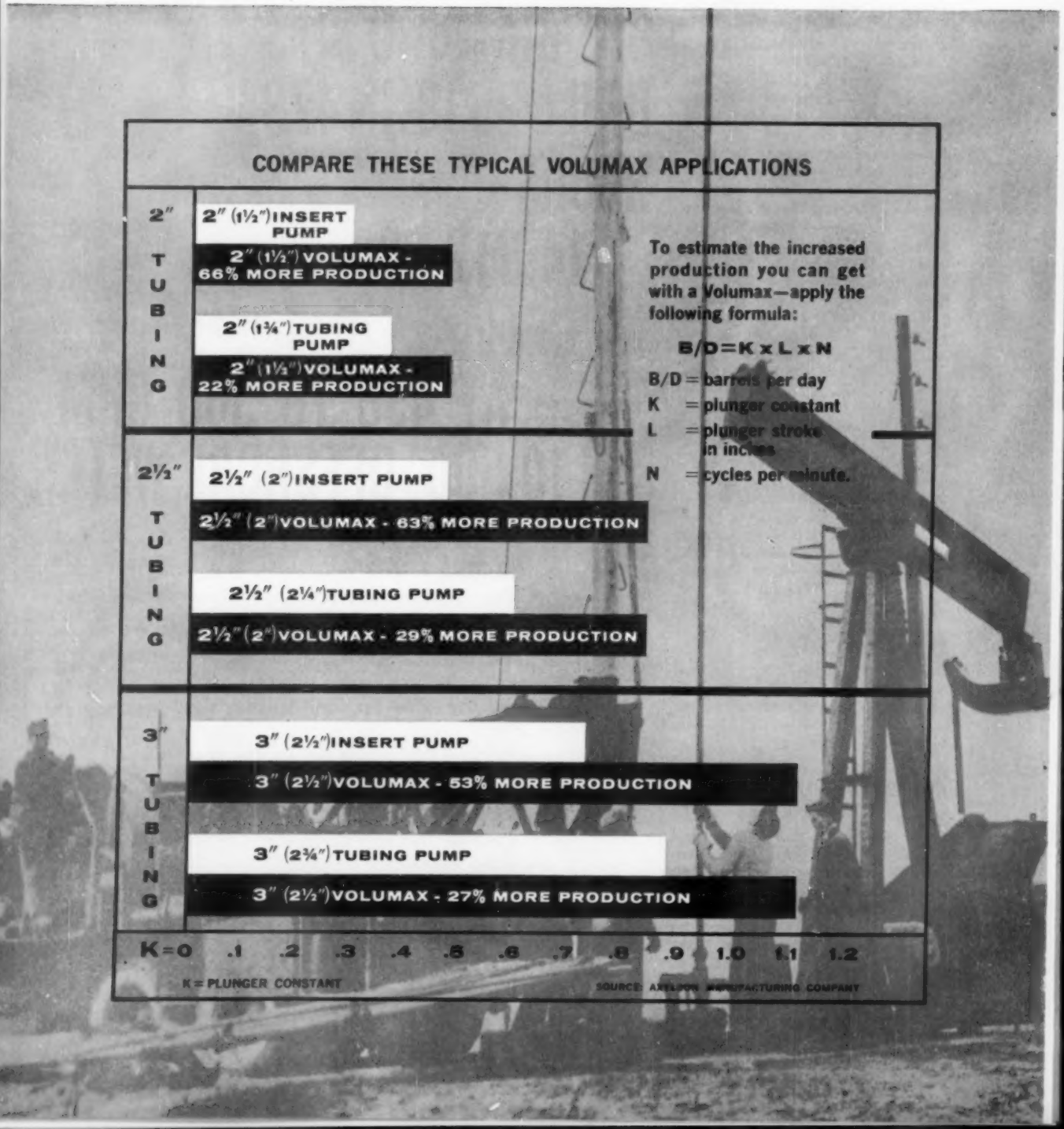
505 AERO DRIVE
SHREVEPORT, LOUISIANA

BRANCH OFFICES IN PRINCIPAL OIL PRODUCING AREAS

DIAMOND CORING • DIAMOND BITS • WELL LOGGING • CORE ANALYSIS

NOW-AXELSON'S

Insert Pump


COMPARE THESE TYPICAL VOLUMAX APPLICATIONS
2" TUBING
2" (1½") INSERT PUMP
2" (1½") VOLUMAX - 66% MORE PRODUCTION
2" (1¾") TUBING PUMP
2" (1½") VOLUMAX - 22% MORE PRODUCTION
2½" TUBING
2½" (2") INSERT PUMP
2½" (2") VOLUMAX - 63% MORE PRODUCTION
2½" (2¼") TUBING PUMP
2½" (2") VOLUMAX - 29% MORE PRODUCTION
3" TUBING
3" (2½") INSERT PUMP
3" (2½") VOLUMAX - 53% MORE PRODUCTION
3" (2¾") TUBING PUMP
3" (2½") VOLUMAX - 27% MORE PRODUCTION
To estimate the increased production you can get with a Volumax—apply the following formula:
B/D=K x L x N
B/D = barrels per day
K = plunger constant
L = plunger stroke in inches
N = cycles per minute.
K=0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2
K = PLUNGER CONSTANT
SOURCE: AXELSON MANUFACTURING COMPANY

NEW VOLUMAX

Outproduces Tubing Pump

It's a fact: Without changing your pump stroke, Axelson's new Volumax will outproduce *any* tubing pump run in your well.

By expanding the pump chambers Axelson's Volumax makes possible an average volume increase of 22% over a 1¾ bore tubing pump and 66% over the largest ordinary rod insert pump in 2" tubing (1½ bore).

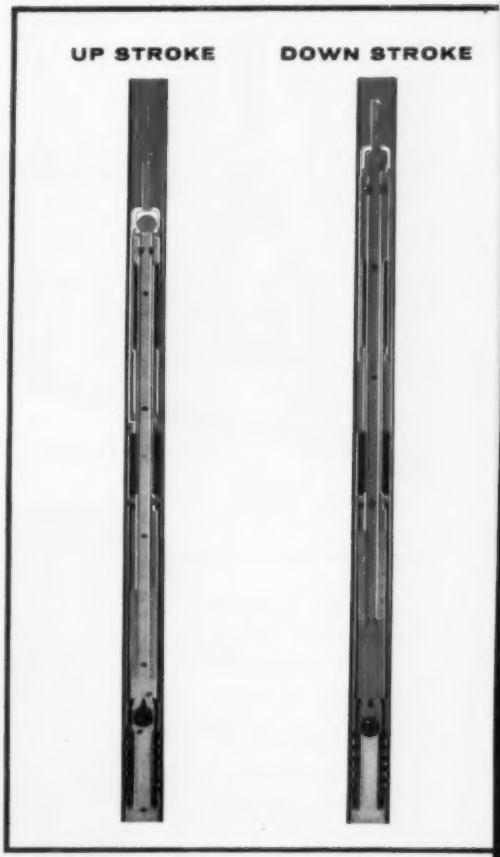
VOLUMAX gives you more because:

1 It's an insert pump; tubing need not be pulled.

2 More production than a tubing pump at *identical* strokes per minute (excellent where large volumes of water must be lifted).

3 Identical production as a tubing pump at *fewer* strokes per minute, this means longer sucker rod life because of fewer reversals of stress.

Write for the new VOLUMAX brochure.



Enlarged annular area offers maximum productive flow

There is no economical substitute for quality.

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Division of U. S. Industries, Inc.
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Since 1898
products designed to give oil a lift

AXELSON PRODUCTS ARE DISTRIBUTED EVERYWHERE

CALIFORNIA: Axelson Sales and Service Stores in all principal California fields
Hickey Pipe and Supply Co., (sucker rods), Los Angeles, Coalinga

MID-CONTINENT AND EASTERN: Jones and Laughlin Steel Corp., Supply Division, Tulsa

ROCKY MOUNTAIN: Jones and Laughlin Steel Corp., Supply Division, Tulsa
Great Northern Tool and Supply Co., Billings

CANADA: Jones and Laughlin Steel Sales Co., Ltd., Supply Division, Calgary
Dominion Oil Fields Supply Co., Ltd., Calgary

FOREIGN: Represented in all major oil-producing areas.

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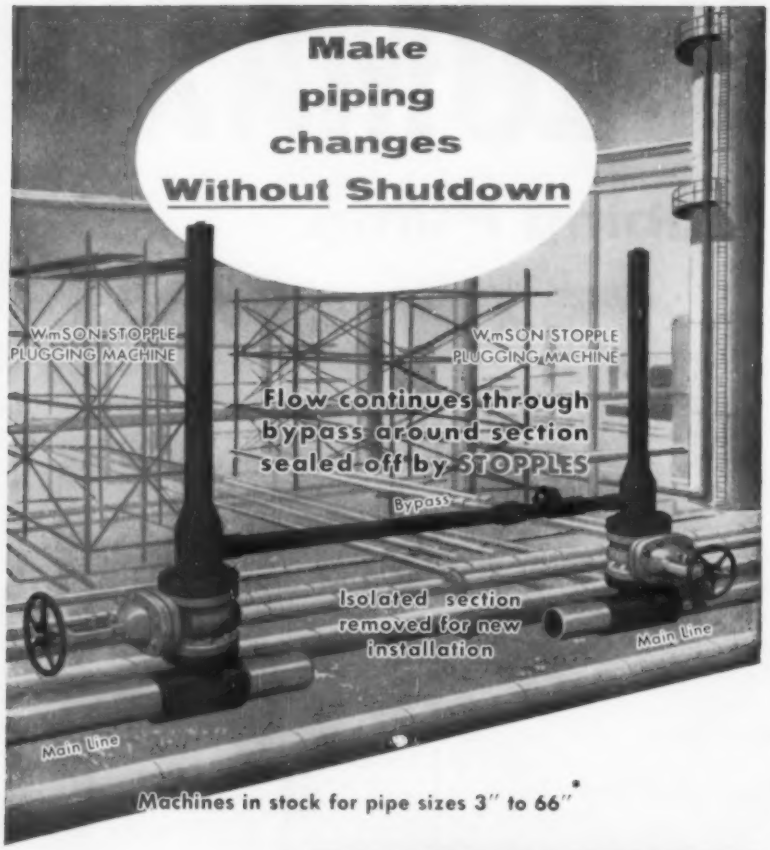
Make piping changes Without Shutdown
WmSON STOPPLE PLUGGING MACHINE
WmSON STOPPLE PLUGGING MACHINE
Flow continues through bypass around section sealed off by STOPPLES
Bypass
Isolated section removed for new installation
Main Line
Main Line

Machines in stock for pipe sizes 3" to 66"

Large inland Refinery tests 8" Stopple in steam line at 475° F. Held 160 PSI pressure 5 days without leakage.

Machines are for steel or cast iron pipe containing:
• Oil • Gas • Steam
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but, I believe that with your nudging I'll shift a little in the direction you suggest. I hope that with my nudging the industry will shift a little in the direction I suggest. By this means we're bound to be s h o v e d within speaking distance of each other eventually.

Thanks for a very interesting and fair presentation.

O. T. Howard
Professor of Geology
Baylor University
Waco, Tex.

Standard form cause aided

Dear Sir:

The article about the Interstate Oil Compact Commission forms (OGJ, Mar. 10, p. 84) has elicited a lot of very complimentary comments from a number of people in the industry. I believe this article has had the effect of stimulating people who are involved in other types of reports such as our oil and gas accountants and our people who, in collaboration with other members of the industry, gather statistics on drilling, supply and demand, etc.

The article has had a very stimulating effect in every way and The Oil and Gas Journal is to be congratulated on the way in which it handled the matter.

O. P. (Pete) Nicola, Jr.
Phillips Petroleum Co.
Chairman, Subcommittee of IOCC Regulatory Practices Committee

Pittsburgh reader answered

Dear Sir:

In the Journal of March 17 (p. 60) you have a letter from one of your readers who signs himself "An Oil and Gas Journal Reader, Pittsburgh," but does not give his name. He makes one statement to which I cannot help but take exception.

He states the law of supply and demand is making itself felt and that the over-all economics will not stand for the increase of price of domestic crude and, therefore, the millions of users would be better off by continuing to import oil.

What products are there which cannot be shipped in cheaper than we make them. It seems to me that everything we wear, everything we eat, and many of the products of the houses in which we live can be fabricated in Japan, India, and other foreign countries far cheaper than we can make them here. So based on that reasoning, why not ship in everything? Where the money would come from to pay

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for all the imports will be up to your eastern reader.

Cotton fabrics, for instance, can be bought across the line from El Paso, Tex., in Juarez, Mexico, for approximately one-half the price in El Paso. This I know because I did it recently in a small amount. But I also realize that we cannot make a practice of this or the entire economic structure of this country would have to be lowered to the level of the countries from which we import.

For many years the large importing companies contended that the reason for importation of crude was to conserve our own reserves. Now that the general public knows . . . that long before our reserves are used up other means of energy will be used, this statement is not made so much. Recently one of the Gulf (Oil Corp.) officials admitted under questioning that the reason they imported was because it was cheaper. . . .

I wonder what would happen if you would start importing all textiles and idle all the textile mills in the East and South.

Ben F. Brack
Oil Operator
Wichita

How about storing imports?

Dear Sir:

The domestic oil producing companies are howling loud and clear each day because of excessive oil imports into this country . . .

At the same time many of our larger oil companies have discovered tremendous oil reserves in foreign countries. These companies . . . demand a return on their investment . . .

To satisfy all concerned the following plan should be put into effect. Increase our imports of foreign oil into the United States and sell most of it to the federal Government. The Government would then pump the excess oil into the many salt domes along the Texas and Louisiana Gulf Coast.

Many of these domes are tremendous in size and capable of holding in reserve many billions of barrels of oil. The Government would then hold these reserves in storage in the United States and could draw on them in the future as our own domestic reserves are used up.

It seems that this would be the best way to bolster the economy of the foreign oil producing countries. Is it not also to our advantage to get something in return for billions of dollars we hand out year in foreign aid?

The monies used for this purchase could be taken from the billions

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poured into our social security fund each year. We would then have a source of income for our old age benefits. As our domestic supply decreases the Government would start selling the stored foreign oil and use the profits to pay for our retirement.

With such a plan as this all parties concerned will prosper. We will: (1) increase drilling activity; (2) find more undiscovered reserves in the United States; (3) build a stockpile of foreign oil in the U.S.; (4) the Government would be getting something in return for foreign aid; (5) foreign oil-producing countries would receive full payment for their oil; (6) we would provide a source of income for our old age.

Paul Swenson
Houston.

CALENDAR

APRIL

8 American Institute of Chemical Engineers, Philadelphia-Wilmington section, University of Pennsylvania, annual meeting, University of Pennsylvania campus, Philadelphia.

8-9 Gas Compressor Institute, sponsored by University of Kansas and Southwest Kansas petroleum industry, Randall's Cafeteria, Liberal, Kans.

9-11 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Biltmore Hotel, Oklahoma City.

13-18 American Chemical Society, national meeting, San Francisco.

15-17 University of Oklahoma, thirty-fourth annual gas measurement short course, North Campus, Norman, Okla.

15-17 National Petroleum Association, fifty-fifth semiannual meeting, Hotel Cleveland, Cleveland.

15-18 American Welding Society, annual meeting and welding show, Kiel Auditorium, St. Louis.

16-18 Natural Gasoline Association of America, annual convention, Baker and Adolphus Hotels, Dallas.

17 Petroleum Equipment Suppliers Association, Pacific district meeting, Beverly-Hilton Hotel, Los Angeles.

17-18 Texas Technological College, fifth annual West Texas oil lifting short course, Lubbock, Tex.

17-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, Louisiana-Arkansas, East Texas, and Mississippi petroleum sections, gas technology symposium, Shreveport, La.

17-18 Geophysical Society of Tulsa, Tulsa Geological Society, annual midwestern exploration meeting, Tulsa.

17-19 American Institute of Mining, Metallurgical, and Petroleum Engineers, Pacific Northwest regional conference, Spokane, Wash.

17-19 San Angelo, Tex., Geological Society, third biannual field trip, Brownwood Hotel, Brownwood, Tex.

20-23 American Institute of Chemical Engineers and Chemical Institute of Canada, chemical engineering division; Canada-U.S. chemical engineering conference, Montreal.

21-23 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Cosmopolitan Hotel, Denver.

23-25 Second International Williston Basin Symposium, sponsored by Saskatchewan Geological Society and North Dakota Geological Society, Regina.

27-30 American Association of Petroleum Geologists, Rocky Mountain section, Casper, Wyo.

28-29 University of Oklahoma, third annual conference on automatic control in the petroleum and chemical industries, Oklahoma Memorial Union Building, Norman, Okla.

28-29 Independent Petroleum Association of America, mid-year meeting, Sherman Hotel, Chicago.

28-30 Southern Gas Association, annual convention, Dallas.

29-May 1 Petroleum Industry Electrical Association, Petroleum Electric Supply Association, annual joint meeting, Adolphus Hotel, Dallas.

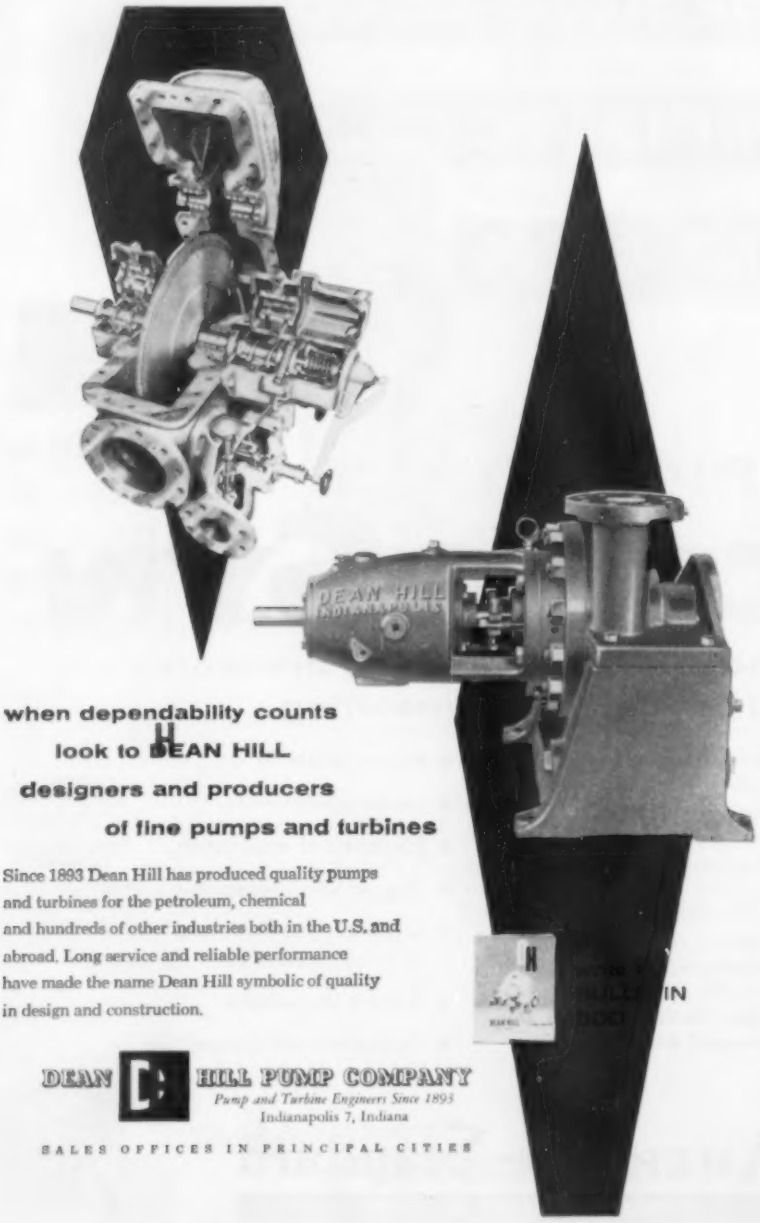
MAY

5-6 Society of Petroleum Engineers of AIME, North Texas section, secondary-recovery symposium, Wichita Falls, Tex.

5-7 Purdue University, thirteenth annual industrial waste conference, Purdue Memorial Union Building, Lafayette, Ind.

5-9 American Gas Association, distribution, production, and transmission conference, Roosevelt and Commodore Hotels, New York.

7-9 American Petroleum Institute, Divi-



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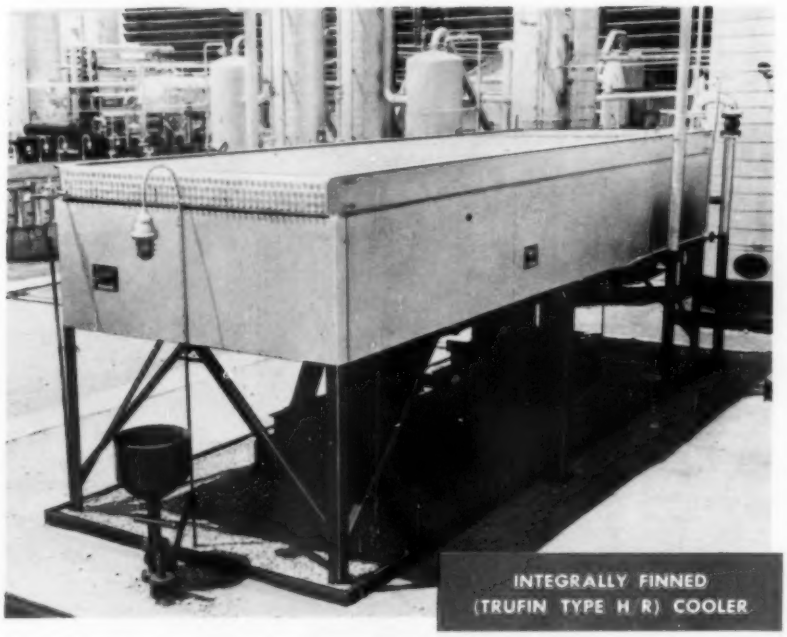
AIR COOLER TUBED WITH WOLVERINE TRUFIN® TYPE H/R



INTEGRALLY FINNED (TRUFIN TYPE H/R) COOLER

BY ERNEST DODD

Of major interest to the processing industry—particularly in those areas where water is scarce or costly—is the operating record of an air cooled Monoethanolamine heat exchanger currently on stream in a West Texas gas plant.

The unit is tubed with Wolverine Trufin Type H/R high-finned aluminum condenser tube and was fabricated by the **Happy Company** of Tulsa, Oklahoma.

Since going on stream in May, 1954, it has operated continuously, effectively and economically in handling a heat load of 4,000,000 btu's per hour in cooling 200 gpm of 8% MEA solution from 160° F. to 120° F. with 100° air at 3000 feet elevation. Coil design pressure is 150 psig at 250° F. The coil is 6-pass and has four rows of 1" O.D. x 24' long aluminum high-finned tubes.

Wolverine Trufin Type H/R is ideally suited for air-cooled operations and proved, in this case, to be the most economical tube in both capital investment and maintenance. Type H/R's ratio of outside to inside surface area is approximately 8:1. It is available in a wide range of sizes in both copper and aluminum.

Because its integral fins are squeezed directly from the tube wall, they have a life expectancy equal to that of the tube —they can never shake loose because of vibration, thermal shock or pressure variations.

Listed on page 4 of this insert are the names, addresses and telephone numbers of Wolverine's highly skilled Technical Sales Representatives. If you want more information about Wolverine Trufin — or if you have a problem concerning the use of finned tube in heat transfer applications just call the one nearest you. There is no obligation.

Wolverine Pioneered Integrally Finned Tube

In recent years, increased heat transfer effectiveness through the use of extended surface tubing has become a well established principle and accomplishment.

A large share of the credit for this is due to Wolverine Tube because of its pioneering in the field of integrally finned condenser tube.

In manufacturing this type of tubing, Wolverine extrudes the fins spirally from the tube wall. This extrusion process produces a smooth fin minus sharp angles or crevices. The fins are actually part of the tube wall and are unaffected by excessive vibration or other hazards.

Wolverine Trufin is available in a wide range of sizes and alloys in copper, aluminum and electric-welded steel. Its various types are S/T (for shell and tube condensers), H/A, H/R, and L/C (for air cooled use primarily) and Type I/L (a high finned exterior tube with longitudinal interior fins).

TRUFIN CATALOG AVAILABLE—FREE

Wolverine's Trufin Catalog carries complete descriptions of each type of Trufin condenser tube. In addition to sizes, metals and alloys the catalog also describes the various applications where integral finned tube can be used to full advantage. This book is a valuable source of finned tube information —should be in the reference file of every processing engineer. Write today for your free copy—there is no obligation.

interchangeable with plain condenser tube (Type S/T only)

easily fabricated—available in U-bends

one-piece construction

several types of end treatments available

high finned outside to inside surface ratios up to 8-1. (Types H/R, L/C, and I/L)

available with either high or low fins with a wide variety of fin spacings

smooth extruded fins eliminate sharp angles and crevices

fins stand up under thermal shock, vibration and pressure changes

available in copper, copper-base alloys, aluminum and electric-welded steel

more BTU's per foot of tube

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ON STREAM TIME UPPED WITH TRUFIN ON JOB

Designers — when working for the first time with integrally finned condenser tube—sometimes assume that finned tubing should be used only in a clean service.

Nothing could be farther from the truth. The compilation of actual operating data and the results of extensive pilot plant research are proving, instead, that integrally finned Wolverine Trufin actually gives better service than plain tube over longer periods of time.

Comparison tests have shown that when Trufin fouls, the build-up of the scale follows the profile of the fins and tube instead of preferring the valleys between the fins. Thus because Trufin does not present a flat, unbroken surface there is a strong tendency for the scale to fall away which prevents the build-up of an impervious layer.

TRUFIN HELPS CUT STRUCTURAL WEIGHT

Design of smaller heat exchangers and condensers is now possible because of Wolverine Trufin. This integrally finned condenser tube transfers more BTU's per foot of tube — thus permitting more heat transfer surface to be packed into a given area.

Where overhead units are used, the compact, powerful Trufin units require less structural support—an important feature which contributes substantially to lower costs.

Write for FREE Book

Actual installations where Wolverine Trufin is being used throughout the processing industries are described in "Wolverine Trufin Process Flowsheet Book".

In addition, this handy book contains information about Wolverine Tube, its facilities and the specialized services it offers its customers.

Processing engineers—both experienced veterans and those just starting their careers—will want to add the Trufin Process Flowsheets Book to their reference files. Write for your copy today.

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sion of Production, eastern district meeting, Deshler-Hilton Hotel, Columbus, Ohio.

8-9 Texas Petroleum Research Committee, eleventh oil recovery conference, symposium on "A Century of Texas Oil, 1875-1975," University of Texas, Austin.

11-14 Texas Independent Producers and Royalty Owners Association, annual membership meeting, San Antonio, Tex.

12-14 Chemical Institute of Canada, National Research Council, eighth Canadian high polymer forum, Macdonald College, St. Anne de Bellevue, Quebec.

12-14 Instrument Society of America, symposium of analysis instrumentation division, Shamrock Hilton Hotel, Houston.

12-15 American Petroleum Institute, Division of Refining, midyear meeting, Statler Hotel, Los Angeles.

12-15 American Society of Mechanical Engineers, oil and gas power division conference, Bellevue-Stratford Hotel, Philadelphia.

20-22 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

21-22 Western Petroleum Refiners Association, Southwest regional technical-industrial relations meeting, Hotel Paso del Norte, El Paso, Tex.

21-23 Rocky Mountain Oil and Gas Association, thirteenth annual convention, Cosmopolitan Hotel, Denver.

21-23 American Petroleum Institute, Division of Marketing, midyear meeting Roosevelt Hotel, New Orleans.

22-23 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

26-28 Chemical Institute of Canada, annual conference and exhibition, Royal York Hotel, Toronto.

27-29 Annual Short Course in Gas Technology, Texas College of Arts and Industries, Kingsville, Tex.

JUNE

2-4 Petroleum Electric Power Association annual meeting Texas Hotel, Fort Worth.

5-7 National Oil Scouts and Landmen's Association, annual meeting, Mayo Hotel, Tulsa.

8-11 American Petroleum Institute, Division of Transportation, annual tanker conference, Greenbrier Hotel, White Sulphur Springs, W. Va.

10-12 Appalachian Underground Corrosion Short Course, School of Mines, West Virginia University, Morgantown, W. Va.

19 Pennsylvania Grade Crude Oil Association, annual meeting, Penhills Club, Bradford, Pa.

22-27 American Society for Testing Materials, annual meeting and exhibit, Hotels Statler and Sheraton-Plaza, Boston.

23-25 Interstate Oil Compact Commission, midyear meeting, Hotel Utah, Salt Lake City.

25-26 Western Petroleum Refiners Association, Mid-Continent regional technical-industrial relations meeting, Broadview Hotel, Wichita.

24-27 Canadian Gas Association, fifty-first annual meeting, Manoir Richelieu, Quebec.

28-July 2 Petroleum Equipment Suppliers Association, twenty-third annual meeting, Chateau Frontenac, Quebec.

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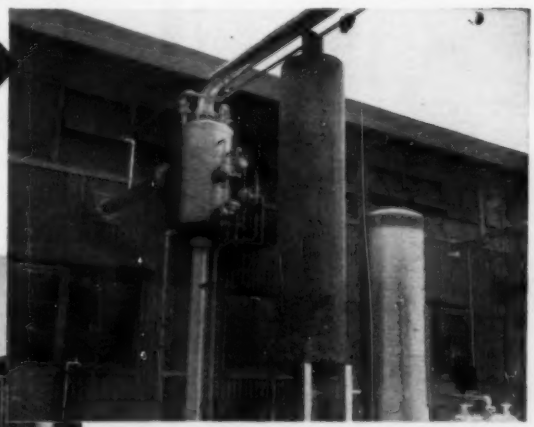

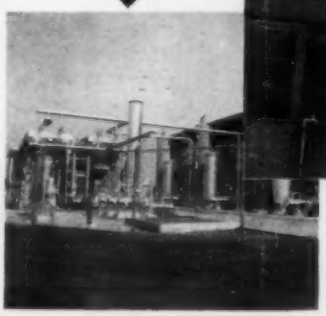

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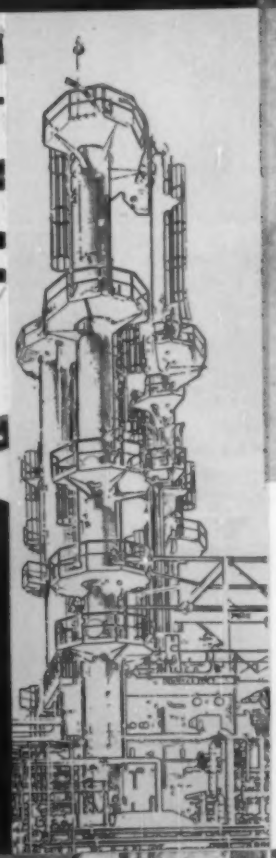

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TULSA, OKLAHOMA

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JOURNALLY SPEAKING

Pipeline Crime

THE SPECIAL articles on pipelines in this issue (pp. 125-147) call to mind the early days of products pipelining in the Mid-Continent when pipeline companies had to have their own police forces to fight off criminals.

The crime was tapping the lines to steal gasoline, and the practice thrived particularly in Oklahoma. Oklahoma was a bit on the wild and woolly side in those days, and besides the Sooners knew all about gasoline and pipelines. A thief in another part of the country might not have thought of digging up a pipeline and boring a hole in it, or might have thought it too dangerous to try. But it was child's play to men who had worked around oil fields and refineries.

Furthermore, the practice of helping yourself to free gasoline from a pipeline had never been particularly frowned on. Natural gas contained a lot of liquid in those days, and this would condense at low spots in the gas lines. So the natural-gas pipelines were equipped with petcocks so the "drips" could be drained off periodically. Since the liquid was usually wasted anyway, nobody cared much if a fellow transferred a few gallons of this to his car.

This natural gasoline was about as wild and woolly as the drivers of the early-model cars, but it was during the depression and the Oklahomans used a lot of it. When refinery gasoline started moving in pipelines it was quite natural for the free-loaders to try to upgrade their supply.

The first big gasoline line in Oklahoma was the Great Lakes line, completed in 1931. During the next year it was tapped a total of 37 times by gasoline thieves.

The usual practice was to dig a pit down to the line, drill a small hole through the pipe, let the gasoline pour out into the pit, bail out a couple of barrels, and go away leaving the leak running. The actual quantity of gasoline used by the thieves didn't bother the company nearly as much as the subsequent waste and the work of locating and repairing the leak.

Great Lakes kept a close check on its line pressure, and in this way could usually tell when a section had been tapped. Then the crooks grew smarter and bolder. They would connect a small pipe to the line, run it off to some secluded spot, and put a valve on the end. If their plumbing didn't leak, and if they covered over their ditch well, these taps were very hard to detect. Some enterprising operators made quite a business of peddling tank loads of gasoline from such taps.

To supplement its regular pipeline walkers, Great Lakes hired a force of "special agents," headed by a former Texas Ranger, and at times these men had to shoot it out with the villains in the best traditions of TV horse operas. One of its special agents was held up at gunpoint, taken off in the woods, and tied to a tree with barbed wire.

Catching the crooks required a lot of cloak-and-dagger sleuthing, but getting them convicted was even harder. Some courts didn't seem to think the crime very serious. When apprehended, the tappers usually jumped their bond or got off with a suspended sentence. One bail jumper was traced all over the Southwest and finally nabbed in Denver.

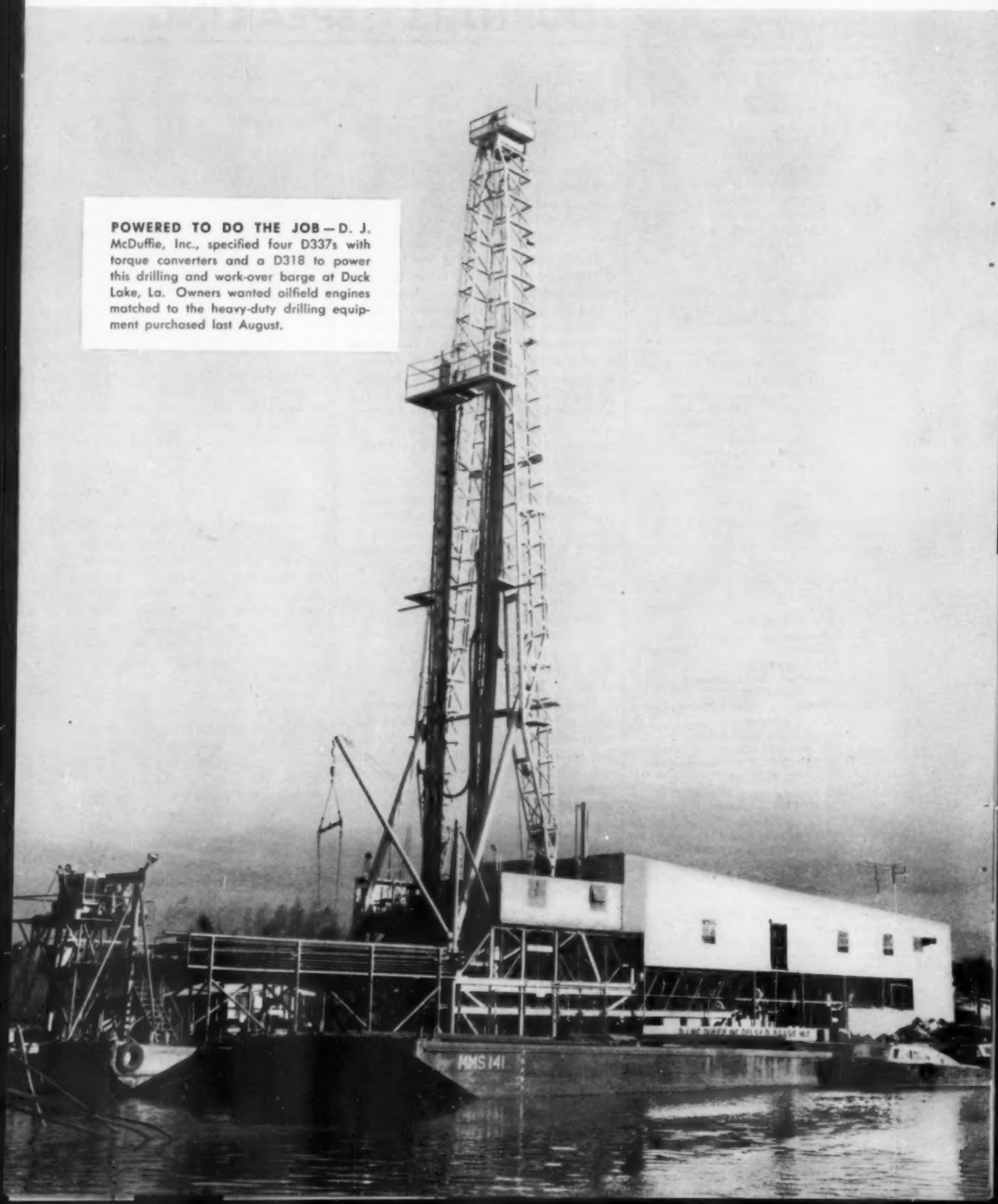
Another time the agents couldn't pin enough direct evidence on a big operator to convict him, but in the course of their investigation they discovered a moonshine still in his barn and got the court to take him out of circulation for 3 years for bootlegging.

But perseverence pays and crime doesn't, so virtue finally triumphed. Between 1933 and 1935 Great Lakes discovered 24 taps and got 17 convictions. Pipeline tapping began to lose its appeal. About this time gasoline taxes were imposed, and the revenooers took an interest in the problem.

For the past 20 years or so pipeline tapping has been practically unheard of. But the old special agents still spin hair-raising yarns of their experiences.

—*Henry D. Ralph.*

A drilling and work-over rig gets the



POWERED TO DO THE JOB—D. J. McDuffie, Inc., specified four D337s with torque converters and a D318 to power this drilling and work-over barge at Duck Lake, La. Owners wanted oilfield engines matched to the heavy-duty drilling equipment purchased last August.

"power to do the job"–5 CAT Diesels

When D. J. McDuffie, Inc., Plaquemine, La., equipped a new drilling and work-over barge, it wanted engines with the "power and speed to do the job." That's why modern, heavy-duty Cat Oilfield Engines were specified.

As the barge reworks Duck Lake wells in Louisiana, four D337s with torque converters and Ideco compounds drive Ideco drawworks and Gardner-Denver mud pumps. In addition, a D318 drives an Oilwell high-pressure pump. The four D337s are equipped with a keel cooling system.

Here's a barge ready to tackle any job, any time, anywhere. McDuffie, Inc., now has oilfield power that is engineered to match their drill rig equipment. These engines carry a reputation for dependability and low operating cost.

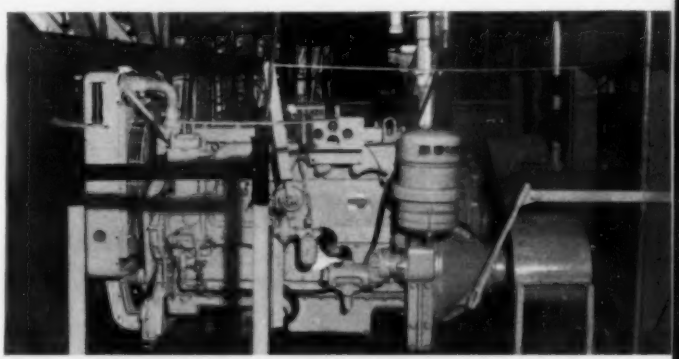
Modern, heavy-duty engines featuring a four-cycle design give you smooth, efficient power. The Cat torque converter automatically adjusts to changing load conditions.

You can choose your power equipment from a full line of Cat Oilfield Engines, available with up to 650 HP (maximum output capacity). These units are also available as diesel and spark-ignition electric sets from 30 to 350 KW (continuous).

So, when you're selecting oilfield equipment, be sure you get the most modern power available by specifying Caterpillar Oilfield Engines. And for replacement power, see your Caterpillar Dealer. He knows the problems of the oilfield.

Engine Division, Caterpillar Tractor Co., Peoria, Illinois, U. S. A. Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

FOUR CAT D337 ENGINES with torque converters drive Ideco drawworks and Gardner-Denver mud pumps through an Ideco compound. McDuffie, Inc., switched to Cat Oilfield Engines last August when the new rig was purchased.



THIS D318 DIESEL drives an Oilwell high-pressure mud pump for McDuffie's operations at Duck Lake, La. Like all engines on the rig, it is expected to operate 24 hours a day, the year around.

ENGINE POWER BY CATERPILLAR

NON-FOULING FUEL INJECTOR

is a small capsule that can be replaced easily and inexpensively. The single, large orifice combined with the Cat-designed precombustion chamber affords foul-free operation on a wide range of fuels.

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☐ I would like detailed information, as I may be in the market for a Cat Engine or Electric Set. I understand that I am under no obligation.

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INCREASES PRODUCTION by eliminating tubing breathing and buckling, thus lengthening the effective pump stroke and raising volumetric efficiency. While it is often difficult to determine exactly how great such increases are, many operators have told us that they have experienced as much as 50% gain.

GREATLY REDUCES ROD, TUBING AND CASING WEAR by eliminating the chief causes of such wear—tubing breathing and buckling. Many Baker Compensating Tubing Anchors, installed over a year ago in wells that had been averaging as high as 18 rod jobs per year, have been in continuous use ever since—**with no rod jobs yet!**

AUTOMATIC OPERATION eliminates the need for involved calculations and the application of tension from the surface. Since the Anchor is designed to allow only downward movement of the tubing, the exact amount of tension required to eliminate both breathing and buckling is automatically applied by the natural elongation of the tubing itself.

SAFE, POSITIVE RELEASE is accomplished by merely rotating the tubing to the right. There is also an emergency release, in the form of a Shear Ring, for extreme conditions.

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Unequal burdens in curbing oversupply

IN the current dramatic effort to bring supplies of oil down in line with demand, certain important producing areas are shirking their responsibilities. (See page 103 of this issue.)

True all areas—except the Rockies—are producing less than early last spring at the peak of the scramble to supply Europe. But a fairer comparison is with the more normal period of 2 years ago.

The combined production of Texas, Oklahoma, and Kansas is about 22% less than 2 years ago, while that of the other important producing areas east of California is about 4% higher. In that interval total demand has increased about 4%, while total imports have increased about 12%.

OBVIOUSLY THREE STATES are the major sufferers from the fact that imports increased faster than demand. And these three—particularly Texas—are making almost all the sacrifice to work down the excessive inventories that piled up from all sources for some 18 months after the Suez Canal reopened.

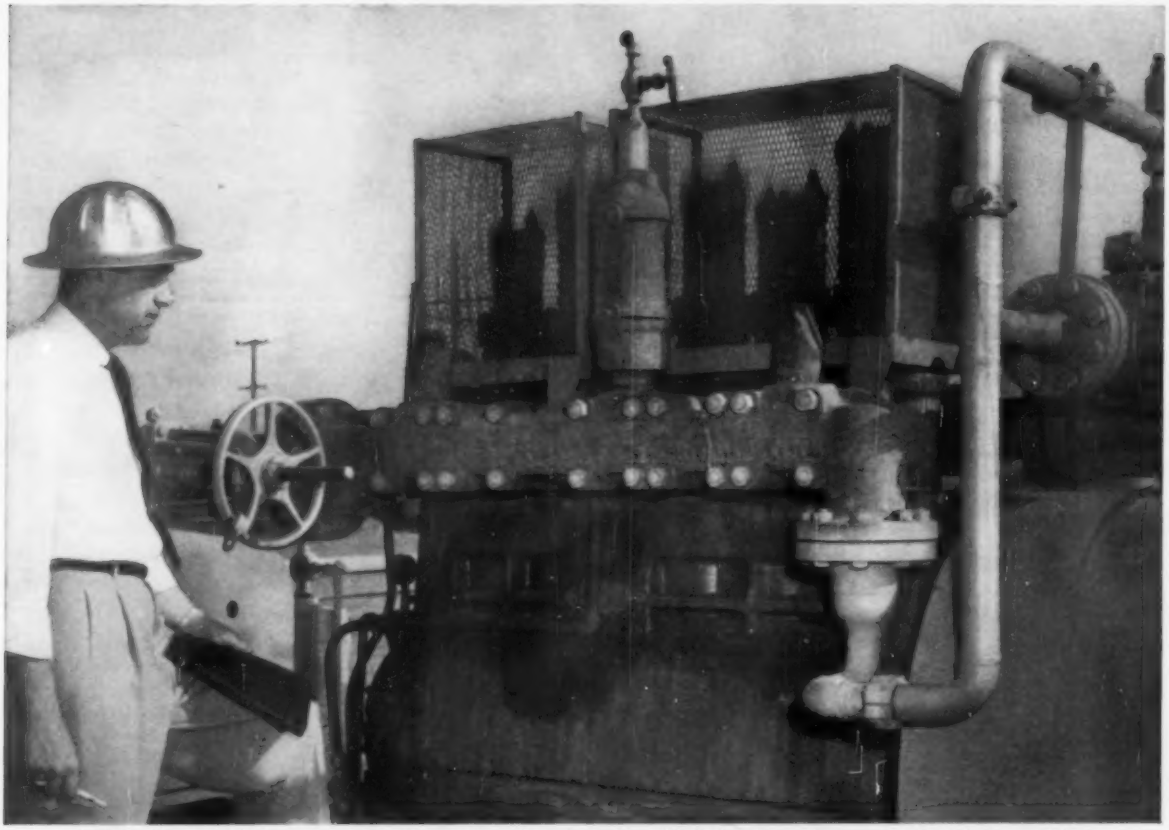
The remedy for the excess is to cut supply all around until things get back into balance. This ought to mean approximately equal sacrifice by all suppliers. But it hasn't worked out that way. Texas has borne the lion's share of the curtailment, with big assists from Oklahoma and Kansas producers and a few established importers. Most other areas are producing more than they did 2 years ago.

Of course these other areas do not have as many barrels to cut as Texas has. And there is an irreducible minimum in curtailment of older fields everywhere. But if these other areas had made sacrifices anywhere near in proportion to Texas', the supply-demand balance would be in far better shape today.

IT COMES WITH POOR GRACE for Illinois and the Rocky Mountain states to complain about oversupply and put all the blame on imports when they refuse to adopt proration measures to keep their own output in line with demand. Louisiana and New Mexico do have proration systems, but both are producing more than 2 years ago.

The fight to limit imports is, in its essence, an attempt to find a formula for prorating imports to domestic demand. This laudable aim would have more substance if all U. S. production were likewise prorated to demand.

It is unfair and unreasonable to expect Texas, a couple of other states, and a half-dozen established importers to do all the adjusting and curtailing while other producing areas continue to contribute to the oversupply. These other producing areas should begin prorating to market demand before complaining that other suppliers aren't doing enough of it.



Nickel-aluminum bronze protects the fluid ends of pumps made by Aldrich Pump Company of Allentown, Pa. from costly salt water corrosion. Philadelphia Bronze and Brass Corporation is supplying Aldrich with nickel-aluminum bronze (5% nickel) working barrels, suction and discharge manifolds, valve spring retainers, stuffing boxes, gland rings, studs and nuts for stuffing boxes, and plunger rod bushings.

Pumps salt water . . . is 6 times more corrosion-resisting with nickel-aluminum bronze fluid ends

No working barrel failures and no evidence of corrosion after two to three years service

Salt water corrosion of pump parts was a serious and costly maintenance problem at a California waterflood. In some cases corrosion fatigue knocked out carbon steel working barrels within a short two to four months. And other fluid end parts had to be replaced much too soon. Then . . .

the Aldrich Pump Company introduced fluid ends of Ni Bral*, nickel-aluminum bronze

Highly resistant to corrosive salt water, working barrels of nickel-aluminum bronze have neither failed nor shown evidence of corrosion after two to three years service at discharge pressures up to 5200 psig.

And nickel-aluminum bronze is not only boosting the service life of the other fluid end parts, it is also providing these parts with better pressure tightness, improved wear, and greater strength.

Proves ideal for oil field service

Experience from this and many other cases shows that nickel-aluminum bronze gives efficient protection against both treated and untreated oil field brines and sea water . . . that it provides the properties needed for reliable performance of pump components, valve discs, and housings in corrosive oil field service.

Whether your metal problem is with pumps, or some other type of equipment, send us the details. Our Development and Research Division will be glad to work with you and help find a solution. *Registered trademark

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the OIL AND GAS JOURNAL

April 7, 1958

Ikard Bill to Touch off Import Battle

Nobody's completely happy with the new compromise control plan. Independents still are insisting on mandatory controls. But the administration is equally adamant on changes in trade act. Showdown will come next week.

A BITTER FIGHT over oil imports will come to the surface next week when Congress opens for business again after the Easter vacation.

The scrap will be touched off by a bill written by Rep. Frank Ikard (D-Tex.). Ikard is a member of the House ways and means committee which has just wound up long hearings on extension of the Reciprocal Trade Act.

Ikard's bill is getting support from large numbers of independent oil producers. It appeals to both the tariff-minded and quota-minded groups.

The measure sidesteps the idea of curbing imports by high tariffs. But it aims at the same end by calling for the sale of import licenses to the highest bidders.

On top of this, it provides for quotas on products as well as on crude oil.

The bill spells out what Congress thought it was enacting 3 years ago in the national security clause (Sec. 7) of the trade act, Ikard said.

Had it been in effect last year, Ikard's plan would have held crude imports to 739,000 bbl. daily, 258,000 bbl. less than actually was brought into the country. Product imports would have been held to 452,000 bbl. daily, a cut of 96,000 bbl.

Domestic producers see the plan to auction off licenses as a possible brake slowing down imports. The price of licenses could run the cost of foreign oil to a point where it would lose much of its attraction.

But some refiners complain that the small operator with a thin bankroll wouldn't be able to sit in the game.

Cool reception . . . The new voluntary import control program went into effect last week.

It met with an icy reception in the industry, Congress, and the State Department.

Congressmen from the oil and coal states denounced the action as too little, too late and too weak. They rolled up their sleeves for a fight to have a definite control system written into the trade law.

The new program is a compromise. As such, it pleases nobody. It got under way under a cloud of dissatisfaction and mistrust.

As a result it is hard to find anyone in Washington who is happy about it.

The State Department isn't happy because the restrictions irk Venezuela and Canada and certainly will not make our relations with Middle East countries any better.

Importers aren't happy. They feel it's the first of many cutbacks in quotas as more newcomers get in.

Brokers aren't happy because they see themselves frozen out of importing.

Refiners aren't happy, some because of low quotas and others because they can't get quotas at all.

Producers aren't happy because they feel the program doesn't go far enough in curbing crude imports and fails entirely to do anything about products.

But unless Congress revamps the national security clause to include the Ikard bill or some other form of quotas, the principles adopted by the administration will be followed for at least a year.

What's at stake . . . The fight over quotas will be a major test of our foreign trade policy.

But Democratic leaders are team-

How the Ikard Bill Would Work

ASSUMPTION: Imports of crude oil or products in excess of their ratio in 1954 to domestic production endanger national security.

THE PLAN:

1. **Over-all quota** for each calendar year will be figured on the basis of Bureau of Mines forecasts of daily average domestic production.

2. **Quotas could be adjusted quarterly** to take account of any seasonal variations or other changes in domestic production and demand. But in no event could imports exceed the 1954 ratio.

3. **Quota limitations could be suspended** by the President during any period when he finds that domestic supplies are inadequate to meet current domestic demand.

4. **Quota allocations among foreign areas** of supply could be made by the President if he desired.

5. **Bids for import licenses** would be called by the President after giving notice of the annual quota. This would be done far enough in advance to allow importers to make necessary tanker and other arrangements.

6. **Import licenses** would go to the highest bidder. Licenses would cover a full year or lesser period at discretion of the President.

ing up with the administration to fend off changes which would be construed abroad as a flagrant disregard of our Government's 24-year effort to reduce trade barriers world-wide.

They may succeed in keeping mandatory oil-import quotas out of the law. At least, the administration hopes they will.

President Eisenhower has declared he will not bargain away any of his program, which calls for a 5-year extension of the law without any major changes.

There is little chance that he will get the long-term, broad authority he is seeking. He may have to bargain to get any part of it or to quiet the demand for quotas on oil.

Eisenhower, for instance, may have to promise to make the voluntary program mandatory.

As between quotas by law and quotas by executive order, the end result would be the same so far as the industry is concerned. The big argument is that controls in the hands of the President might be more flexible and responsive to changes in the economy.

That argument was spiked by Ikard's bill, which tries to fix quotas to swing with the ups and downs of domestic oil demand.

Mandatory control by the White House, however, could be defended better to foreign governments than the same controls imposed in a law purporting to aim at improving international trade, administration officials contend.

Hope for upturn . . . As the new program went into effect, government officials were hopeful that Congress will not vote for quotas.

They also hope for an upturn in the economy sometime in the next few months to ease the tension.

Domestic producers, however, are in no mood to wait. They want an import plan that will effectively deal with quota violations, such as threatened to make the voluntary program impotent. And they want it now.

The Ikard bill, its backers claim, gets around weaknesses of the voluntary program. Its three big advantages:

. . . Minimum of government control is involved. The licensing provisions will work automatically to keep imports within quotas.

. . . Domestic producers will be aided by taking out some of the present advantage of imported oil.

. . . Small inland refiners will be protected to greater extent against the raiding of their markets by products made from foreign crude.

Crude Imports Dip to New Low

CRUDE OIL IMPORTS in February dropped to a modern low of 812,200 bbl. daily.

The February imports were 179,300 bbl. a day below the level of 991,500 bbl. set by the voluntary import programs.

Capt. M. V. Carson, Jr., administrator, reported last week it was the fifth consecutive month that imports fell below the cabinet fuels committee level. For the 6 months in which the control program was in full effect, receipts were 9.6% below the recommended level in Districts 1-4. For the full 8-month period from last July 1 they were only 1.6% above the recommended level.

"These are the unadorned facts," Carson said. "They prove conclusively that crude oil imports have not been mounting steadily since the initiation of the voluntary program."

The February report shows that imports into Districts 1-4 averaged 670,300 bbl. daily (OGJ, Mar. 31, p. 50). The quota for the month was 782,900 bbl. a day.

Imports into District 5 dropped to 141,900 bbl. against a quota of 220,100 bbl.

The reaction . . . Importers apparently intend to comply with lowered quotas under the new control program.

Carson said several importers have said informally they will comply. No importer has said he will not go along.

He added no formal canvass has been made, but the monthly reports for April will show the extent of compliance.

The President's order denying government contracts to noncomplying importers for products made from foreign crude was defended by Interior Sec. Fred A. Seaton.

The Justice Department "obviously" agreed that the Government has the authority to bar violators, Seaton said.

Seaton also expressed belief that the revised voluntary program will work.

Seaton expressed confidence that the ban on violators of quotas will have an effect.

How February Imports Stacked Up

DISTRICTS I-IV
(Thousands of barrels daily)

Established Importers	Present allocation	Actual Feb. 1958	Allocation April 1, 1958
Atlantic	58.9	47.0	53.5
Gulf	111.6	92.1	101.3
Sinclair	62.2	53.4	56.5
Socony Mobil	67.1	66.3	60.9
Standard of California	66.8	48.0	60.7
Jersey Standard (Esso)	72.0	40.0	65.4
Texas	54.5	47.5	49.5
Subtotal	**493.1**	**394.3**	**447.8**
New Importers			
Cities Service	32.6	17.0	29.6
Crown Central	5.0	4.6	4.5
Eastern States	18.3	17.8	16.6
Gabriel	7.5	20.5	6.8
Great Northern	33.0	31.4	30.0
International	12.3	10.0	11.2
Lakehead Pipeline	0.3	0.3	0.3
Lake Superior	5.0	4.5	4.5
Northwestern	13.5	15.3	12.3
Phillips	12.0	16.9	10.0
Shell	7.5	4.7	6.8
Indiana Standard	29.8	22.2	27.1
Standard of Ohio	8.2	6.4	7.4
Sun	50.4	50.6	45.8
Tidewater	34.2	38.7	31.1
Southwestern	2.9		2.6
Bay Refining	3.2	4.3	2.9
Dow Chemical	0.3	0.4	0.3
Texas Asphalt	2.3		2.1
Hess, Inc.	11.5	10.4	10.4
Subtotal	**289.8**	**276.0**	**265.2**
TOTAL	**782.9**	**670.3**	**713.0**

Texas Bears Brunt of U. S. Cutback

Most other states are cutting back too, but not as much. Production in the Rockies is increasing.

IN THE RACE to slash the nation's oversupply of crude and avoid a general price cut, some states are taking their share of the cutback. Others aren't.

Texas is leading the way in holding down production. Kansas and Oklahoma are doing a little better than the nation as a whole. The laggards are the Rocky Mountain states, New Mexico, Louisiana, and the Tri-State area.

The figures showing just how the states or regions are meeting the oversupply crisis were compiled by The Oil and Gas Journal.

To give a true picture, The Journal used the base period of January-June, 1956, from which to plot the percentage of decrease or increase in actual production (see chart). The average of this 6-month period 2 years ago is closer to normal than any period since then.

The closing of the Suez Canal created an abnormal production trend in late 1956 and early 1957 in many states, particularly along the Gulf Coast. In Louisiana production shot upward to 126% of the base period.

Following are the production figures of the states and regions included in the study:

	—Thous. bbl. dly.— Jan.-June '56 avg.	March '58 avg.	Per cent*
Entire U. S.	7,166	6,290	87.8
Texas	3,041	2,302	75.7
Kansas	343	291	84.8
Oklahoma	600	525	87.5
Ill.-Ind.-Ky.	303	301	99.3
Louisiana	808	818	101.2
Wyo.-Neb.-Utah-Colo.-Mont.	553	597	108.0
New Mexico	238	264	110.9

*March production compared to base period.

California was not included in the study because its supply-and-demand characteristics differ considerably from those of the rest of the nation.

While the percentage figures are striking, the statistics on actual barrels of production show even more dramatically how Texas has carried the big load in trying to bring supply within demand.

The entire U. S. has made a cut of 876,000 bbl. daily between the base period and March of this year. Texas itself has accounted for 739,000 bbl. of the total, leaving just 137,000 for the rest of the nation.

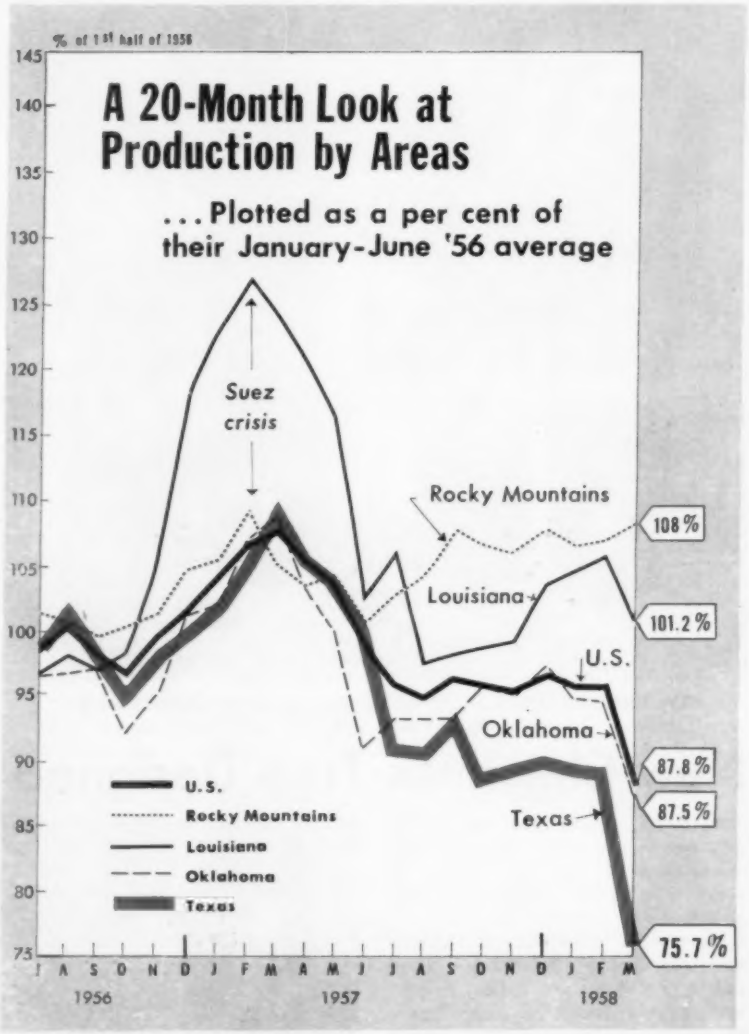
On a percentage basis, this means that Texas has accounted for 84.4% of the decline, although the state produced only 42.4% of the nation's total output during the first half of 1956.

It is notable that the Rocky Mountain states, which have no state regulation of production, actually produced more in March than they did during the first half of 1956. New Mexico, which does have state regulation, also is well above the base period, but this can be attributed at least partly to opening of the Four Corners area to production.

The picture showing the big percentage cut in Texas' production would be even more sharply drawn if figures on April's output were included. The Texas Railroad Commission has ordered an 8-day allowable for April compared with March's 9 days. Oklahoma and Louisiana increased their allowables slightly.

The accompanying chart shows how Louisiana has made a huge cutback in production from the peak period of the Suez crisis, when its output was 127% of the base period.

But even this big drop is considerably less than Texas'. Louisiana's cutback from 127% in February 1957 to 101.2% in March of this year is a difference of 25.8 percentage points. Texas, on the other hand, went from its peak of 109.9% in March of 1957 to 75.7% in March of this year, a difference of 34.2 percentage points.



NEW UNITIZED TREE is examined by officials of Oil Center Tools Co.*

*Left to right in photo: Ross Spencer, sales manager; Jim Witovec, vice president; W. A. Wolff, president; and J. M. LeBeaux, director of research and development.

New Christmas Tree Designed

THE OIL AND GAS well christmas tree, which has worn about the same dress for the past 30 or 40 years, may at last be in for a sleek new look.

Oil Center Tool Co. of Houston has introduced a new unitized design that is one of the few radical changes in wellhead design in many years. OCT's "unitree" uses a single forged-steel piece to serve as the body for all master valves, crown valves, and wing valves. The resulting tree stands only a third as tall, weighs only half as much, and costs less than conventional trees.

Moreover, the one-piece construction does away with the flanged connections between valves, tees, and flow manifolds. Because of this, the new tree should be immune to the problems of leakage, damage, and corrosion that often plague the connections on conventional high-pressure trees.

Because of its light weight and small size, the unitree should be simpler and easier to install. Even the largest tree won't need a platform or scaffold from which to operate the valves.

The valve core and valve can easily be removed, serviced, or replaced in the field by one man.

THE OLD AND NEW—OCT's new unitized tree is much smaller that the conventional tree and eliminates as many as six flanged connections.

Single or dual . . . The unitree shown here is a single-completion model.

OCT says that it can put the same advantages into a similar tree for parallel-string dual or triple completions. Multiple-completion trees would be about the same in appearance except for the number of valves.

The unitree pictured here is only 43 in. high. The flange connection on the bottom connects it to the tubing head or casing spool. While it comes in either single or double-wing models, over-all width is low because wing valves are integral with the tree.

Either 2⅜-in. API or 2⅞-in. API tubing sizes are available in the new tree.

The unified tree has its biggest advantage in high-pressure service. However, because of its simplicity, compactness, and ease of installation and handling, OCT expects the new tree to be popular in lower pressure ratings also.

Valves for the first unitree were made by Mission Manufacturing Co. of Houston. OCT officials say that plug, gate, or ball-type valves of other manufacturers will be adaptable to the unit, too.

Richfield Finds Pay

at new fault-block discovery in California's Tejon area.

THE NORTH TEJON area is proving to be one of the hottest spots in California, with a significant new fault-block discovery and a successful southeast extension to the field.

Richfield Oil Corp. 81-24 KCL I, which is 1¼ miles west of North Tejon field, reportedly flowed 4,000 bbl. daily from a Vedder interval at 9,190 to 9,385 ft. This is considerably higher than Vedder production in the field. Richfield was planning to deepen its "tight hole" discovery.

About 2 miles east of the Richfield discovery and ½ mile southeast of the North Tejon discovery, Reserve Oil & Gas Co. completed its 318-17 Standard-Butler-Wehr-SP for 3,120 bbl. of 34.3°-gravity oil from three selectively perforated Vedder intervals between 11,599 and 12,179 ft.

Another Reserve well, about ¼ mile south of the field discovery, tested the Vedder-Z-4 at 12,015 to 12,174 ft. for 2,000 bbl. daily. The 361-19 Standard-Tejon was drilling ahead to test lower Vedder possibilities.

Reserve opened the Kern County field at its 67 Reserve last year, flowing 250 bbl. daily below 11,850 ft. A confirmation well was completed last November. Site is being readied for another well in the area.

Catalyst Loss Cut

by new method of treating which slows deterioration.

REFINERS with moving-bed cat crackers were assured last week they can cut in half their catalyst-replacement costs.

California Research Corp. said a process it has tested for more than a year in commercial operation will double the life of the catalyst without reducing efficiency.

It is a complex chemical and physical process which prevents rapid deterioration of catalyst beads through attrition.

A. L. Lyman, Cal Research president, said the operator of a 15,000-bbl. unit should save from $135,000 to $250,000 a year through use of the process.

It would cost only about $5,000 to apply the process to a 20,000-bbl. plant, he said, including engineering, installation, and materials. Too, he said, installation can be accomplished in most plants without a shutdown.

Lyman said the process is now being used in eight plants ranging in capacity from 13,000 to 25,000 bbl. daily. Catalyst requirements have been cut from at least 43% to as much as 77%.

Operating costs are less than $5 per day for materials per 100 tons of catalyst treated.

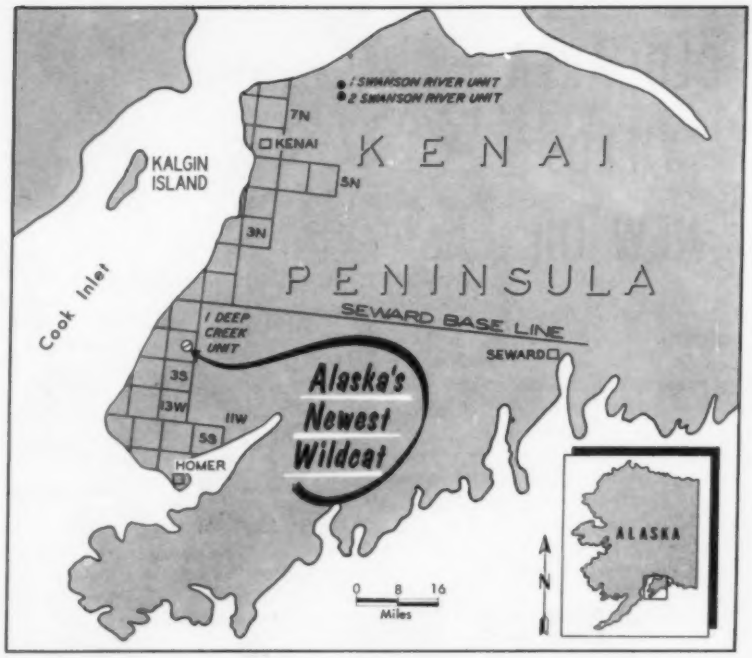
Two of the test units are in the Perth Amboy, N. J., refinery of California Oil Co. One is in the El Paso refinery of Standard Oil Co. of Texas. Another is in Salt Lake Refining Co.'s Salt Lake City refinery, and a fifth is in Standard Oil Co. of California's Richmond refinery.

What is it? . . . Official of the California Standard subsidiary did not disclose the nature of the chemical used, pending granting of patents.

The process is suited for all liquid-feed units, such as Houdriflow or Thermofor cat crackers, as well as for Conflow units with vapor feed. It can be used with a brand new catalyst or one that has lost almost all its activity.

Lyman said higher throughput is made possible in plants limited by coke-burnoff rate. Capacity can be increased 5 to 10% through faster catalyst circulation.

Improvement in cohesion of the catalyst beads also reduces the amount of fines circulating in the system. This cuts the discharge of particles into the atmosphere, improves contacting efficiency in the reactor, regenerator, and stripper, and reduces the load on the cyclone separators.



Kenai Gets Another Test Well

A NEW TEST is drilling below 1,325 ft. in search of a second producing area on Alaska's Kenai Peninsula.

The wildcat is a joint venture of Standard Oil Co. of California, Western Operations, Inc., and its 50-50 partner, Richfield Oil Corp.

The well is the first phase of a $30 million exploratory program for the Kenai basin announced late last year, when Socal and Richfield agreed to pool their holdings, with Standard as operator.

Under the deal, Socal was cut in equally on Richfield's Swanson River Unit discovery on Kenai of last September. The discovery flowed at a 900-bbl. daily rate from an interval at 11,150-11,215 ft. The well has been shut in pending drilling of additional wells to justify the cost of a pipeline to the coast.

Richfield, which holds an 89½% interest in the Swanson River Unit, drilled a second test 2 miles south of the discovery well. The extension found the same productive zone as the first well. Operators set casing to protect the zone and then moved the rig to the Deep Creek Unit test now drilling.

The Deep Creek Unit is approximately 75 miles southwest of the two discoveries.

Combined holdings of Socal and Richfield in Kenai basin total 834,000 acres.

Octanes Climb on West Coast

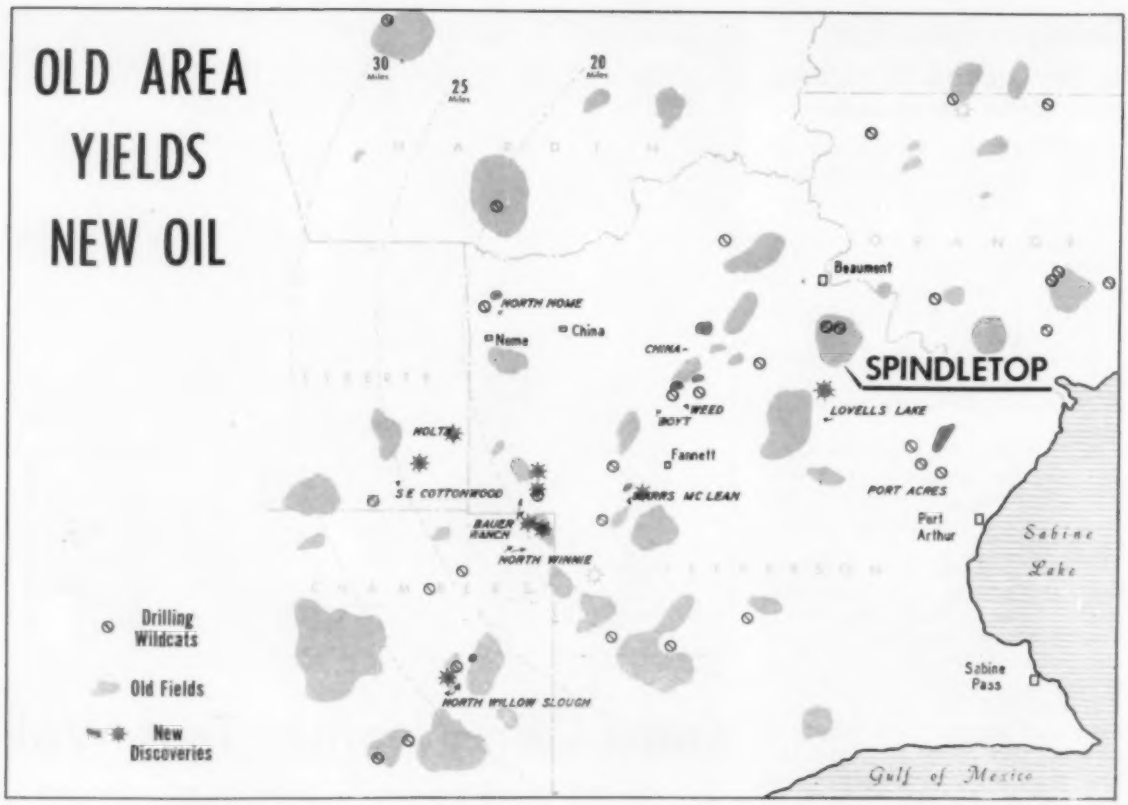
WEST COAST octane ratings are catching up with the rest of the nation.

The octane count for premium gasoline inched up to 98.2 in March—just three-tenths of a number below the 98.5 national average. Only a year ago, there was a difference of nine-tenths between the national and West Coast averages.

The West Coast has shown a better rate of increase than the national average the past year. The nation's average for premium is up only one octane from a year ago. In comparison, increases in West Coast cities range from 1.3 to 1.7 octanes.

Introduction of 100-octane premium by Tidewater Oil Co. is contributing to the upward trend in the far western states. Ethyl Corp.'s March survey shows that four West Coast cities moved into the 98-plus class.

The company reports that the nation's average in March is unchanged from February's 91.1 for regular and 98.5 for premium.



There's More Oil Around Spindletop

Neil Williams
Associate Editor

THE SPINDLETOP area, which gave birth to the Gulf Coast oil industry 57 years ago, once again is the darling of the Texas wildcatter.

Within a 30-mile radius of the gusher that blew out January 10, 1901, the modern-day oil hunter has made 6 new discoveries this year, 12 within the past 6 months, and 16 within the past year.

Some of the revival is taking place directly in the old original shallow sand and cap rock sector of Spindletop itself, where Anthony F. Lucas' fabulous well spewed 75,000 bbl. of oil per day into the air from a depth of 1,160 ft.

Virtually at this same site, 20 to 30 new wells have been completed in the recent development. Other rigs still are probing the deeper sands and new sectors off the flanks of the salt dome that spawned the Lucas discovery.

But fanning out from Spindletop is a host of other wildcat and development operations across northern and central Jefferson County and lapping over into eastern Chambers and Liberty counties. And other wildcatting —but no success as yet—is taking place in two other neighboring counties, Orange and Hardin.

All this proves that the wildcatter, whose constant plugging has uncovered some of the Texas coast's larger oil fields in the area over the past half-century, can still open new horizons around producing areas or prove up major extensions.

Since the latest play began building up early last year, more than 100 wells have been drilled, most of them as exploratory tests. Currently there are 31 active operations under way.

The new production being found in some of the older fields is bearing out the time-worn, but still valid, theory that no Gulf Coast field can be exhausted of all its potentialities despite how intensively it has been drilled.

Where they're dri'ling . . . While the drilling at old Spindletop itself is to about 800 to 1,000 ft., the newer exploration within the 30-mile radius is moving to depths of 7,500 to below 11,000 ft. to tap the Marginulina, Frio Hackberry, and Nodosaria sands, which have produced at nearby fields.

At least 8 of the 16 discoveries of the past year are classed as new fields. Chief of these apparently is at Port Acres, less than 8 miles south of Spindletop and about 5 miles northwest of Port Arthur.

Meredith & Co., a Houston independent, opened Port Acres last August with exceptionally rich gas-condensate production from a lower Hackberry reservoir below 10,500 ft. Michel T. Halbouty-Pan American Petroleum Corp. and Curtis Plumley and associates also are in the play. Five wells have been completed so far, and the productive area has extended more than 1½ miles.

Eight miles west of Spindletop, Meredith has accounted for three other new-field discoveries around the old South China field.

The best of these appears to be the China area, where four completed wells have found good production in an upper Hackberry sand at 7,500 ft.

Old and new . . . On the Jefferson-Chambers county line, some 18 miles

southwest of Spindletop, today's wildcatters have hit more winners.

Actively exploring around the Bauer Ranch and North Winnie areas, operators made several new-pay discoveries and also may have found extensions which link the two areas.

Meredith has opened a new oil reservoir off the west side of the North Winnie, a gas-productive area. The discovery well, completed last month, produced at 8,400 ft. from the Frio-Sullivan zone.

Already Meredith has followed this discovery with another strike just 2,000 ft. to the west. It produces from a Miocene sand at 6,100 ft.

Other play . . . In northwestern Jefferson County, about 18 miles west of Spindletop, Lawrence Kelly brought in a wildcat discovery last December.

Located about 2 miles north of Nome, the well produced oil at 5,500 ft. from the Marginulina sand. An offset well, drilled by Willard Gill, is now being completed in the same sand as the confirmation producer. The area is designated North Nome field.

Moving into the southeastern corner of Liberty County, the wildcatters have added two more new-field discoveries, 20 and 23 miles west-southwest of Spindletop.

Kilroy Oil Co. and Harry Hurt drilled the two successes. One opened the Southeast Cottonwood field last December with gas-condensate production from a Frio sand at 8,575 ft. The other, about 2½ miles to the northeast, came in early this year at Nolte. It also produces gas and condensate from the Frio at 8,600 ft.

New production in Chambers County is at North Willow Slough field, some 27 to 29 miles southwest of Spindletop. At two close-in spots, significant new pays and extension discoveries have been found at Marrs McLean and Lovells Lake in Jefferson County. Marrs McLean is 13 miles southwest of Spindletop and Lovells Lake just 3 miles to the southwest.

The wildcatters also are active east and north of Spindletop in Orange County, where eight test wells are drilling at distances of 4 to 26 miles away. No new successes have been reported so far. One wildcat is drilling in Hardin County, 20 miles to the northwest.

While Spindletop's greatest glory was recorded just 10 days after the new century began, the hoary veteran refuses to retire. In 1958 it's still a part of the living story of oil.

In fact, the Spindletop area, the Gulf Coast's oldest producer, is the most active region of exploration in the Gulf Coast today.

watching WASHINGTON

. . . with Bertram F. Linz

• Loopholes seen in import order

PRESIDENT EISENHOWER'S move to strengthen the oil-import program seems to have settled a couple of problems for domestic operators. But it also is seen as raising some questions.

His executive order put teeth into the program by denying government contracts for products made from imported crude by importers who don't live within their quotas.

It doesn't appear to touch noncomplying importers who offer the Government only products made wholly from domestic crude, however. That could be a pretty big loophole, some domestic refiners say.

The order paves the way for a buy-at-home policy by the Defense Department which may cut purchases of offshore products. It provides that such purchases are to be made only when domestic product is unavailable or is offered at "unreasonable" cost.

But the order doesn't spell out what shall be considered an "unreasonable" price.

In any event, the tightening of the Buy American Act will have little immediate effect. The big items are bought on long-term contracts which will run until next fall.

• Well produces two-price gas

THE FEDERAL POWER Commission is facing a neat little problem in ethics.

It's this: Should the part owner of a well be required to sell his gas for less than half what the other owner is getting?

The well, in Louisiana, is owned jointly by Amerada Petroleum Corp. and Pan American Petroleum Corp. Both were selling the gas to United Gas Pipe Line Co. for 8 cents per M.c.f.

Pan American, which is majority owner, got permission from the FPC to switch its sales to American Louisiana Pipe Line Co. at a higher price.

Now Pan American is getting 19¼ cents per M.c.f. for its share of the gas while Amerada is stuck with the 8-cent price.

Amerada is asking: Is that fair? It wants a rate increase, of course, and may get it. But the Pan American price also is under scrutiny, the commission pointed out, and might possibly be cut back.

• Refiners share air-pollution blame

CONGRESSMEN interested in the fight against air pollution charge that the oil and auto industries are the chief culprits.

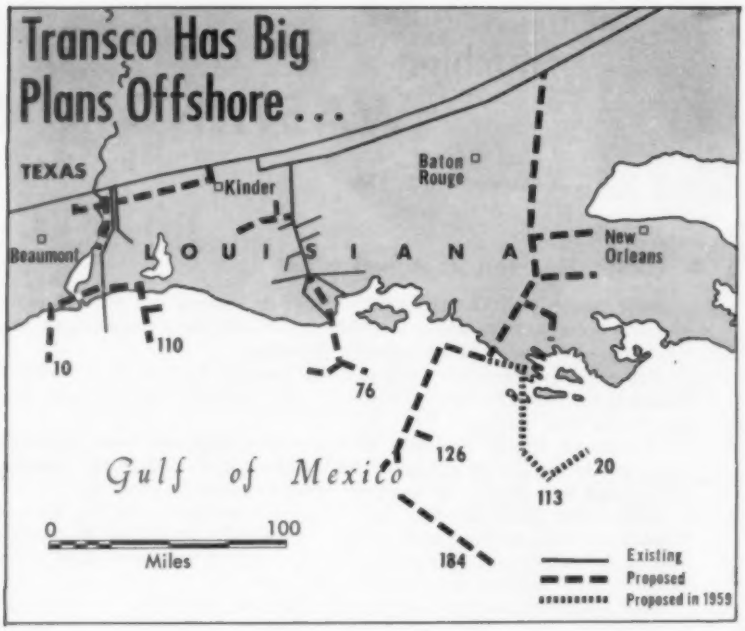
Their main theme is that the two industries haven't licked the problem in a hurry.

The fact is that both refiners and car makers are very much concerned. Oil companies have spent a lot of money on pollution control. But Public Health Service officials say the level of interest is a little higher in the automobile industry.

Research already has shown that air pollution is very complex. Temperature and humidity, the size of particles, even the location of a city, may help develop very harmful pollutants that under other conditions would be harmless.

It has recently been found that exhaust pollution does not occur only when a car is slowing down, as first thought. It prevails all the time the engine is running. On an average, about 7% of the fuel that goes into the engine comes out of the exhaust unburned.

Refiners and car makers will have a chance to defend themselves at a national air-pollution conference scheduled for next fall.



FPC Gets Transco Plan

... for big pipeline expansion in Gulf. Full program is now disclosed for the first time, and it'll cost $165 million.

FEDERAL Power Commission hearings will resume April 15 on applications by Transcontinental Gas Pipe Line Corp. for the largest expansion program in its history.

The 2-year program, costing an estimated $165 million, will boost the capacity of Transco's mainline transmission system by more than 230,000,000 cu. ft. of gas per day. It also will provide about 200 million cubic feet per day additional storage service.

Assuming early approval by the FPC, Transco plans to spend approximately $127 million of the total this year in preparation for increased gas deliveries to its expanding eastern markets during next winter's heating season.

Details of the elaborate construction plans were revealed last week, although part of the program had been announced piecemeal as applications were filed with the FPC. A preliminary hearing was held in March.

What's planned . . . The entire program, including four separate filings, is now consolidated for FPC action. Highlights of the program:

. . . **The most ambitious plan** for gathering offshore gas ever submitted to the FPC. Four networks would take gas from at least 10 fields in the Gulf of Mexico. The offshore lines would total about 147 miles in length and would range from 10.75 to 16 in. in diameter.

. . . **Laying of 204 miles** of 36-in. and 107 miles of 30-in. loops along the company's main line to complete looping of the system from Texas to New Jersey.

. . . **A new purchase lateral** 151 miles in length to pick up gas from at least 11 inland fields in the Thibodeaux, La., area. This lateral also would extend to the coast and connect with proposed offshore lines to the Eugene Island, Ship Shoal, and South Pelto areas of Louisiana.

. . . **A new line** across Pennsylvania to move gas from storage in the Leidy-Tamarack pools to the company's major markets in the New York-New Jersey metropolitan area. This lateral will include 164 miles of 26-in. pipe and 29 miles of 30-in.

. . . **Addition** of more than 48,000 hp. at new and existing compressor stations.

The capacity . . . With completion of the program, Transco's peak day delivery capacity will be boosted to more than 1½ billion cubic feet per day.

This total includes 1,180,201 M.c.f. mainline capacity and plus 340,000 M.c.f. per day from storage. The company last winter had a storage capacity of about 136,000 M.c.f. per day.

Transco's allocated delivery capacity, including that from storage, reached 1 billion cubic feet per day late last year.

Small start . . . The young pipeline giant, headquartered at Houston, made its first gas deliveries on a very small scale late in 1950. Its mainline capacity has increased more than 70% during the past 4 years.

Largely because of its recent aggressiveness in purchasing reserves, the company now has approximately 7.2 trillion cubic feet of gas dedicated to its system. This volume includes approximately 2 trillion cubic feet contracted for last year and still subject to FPC approval.

Details of the company's proposed expansion were withheld until last week in compliance with regulations of the Securities and Exchange Commission governing new securities being offered to the public. The company recently issued $20 million worth of debentures and sold 1,000,000 shares of common stock.

Big buys . . . Most surprising element of Transco's new proposals was the extensiveness of its gas purchases and projected pipelines offshore. Although contracted reserves by area were not revealed, the company obviously has sewed up some of the big gas fields in the Gulf of Mexico.

What's more, completion of its proposed offshore gathering systems would give it a competitive advantage for some other offshore reserves which still are being withheld from the market because of government controls.

Applications filed with the FPC indicate first year deliveries from newly purchased offshore reserves would reach a minimum of about 125,000,000 cu. ft. per day.

In addition, the company is committed to take up to 50,000,000 cu. ft. per day from its single existing offshore line in the West Cameron area. This line, built last year, extends about 9 miles from shore to Block 45 field operated by Mecom Petroleums.

Offshore suppliers would include the following:

Phillips Petroleum—Block 40, West Cameron, and Blocks 128 and 184, Eugene Island; MCN—Block 110, West Cameron, Block 126, Eugene Island, Block 20, South Pelto, and Blocks 72 and 113, Ship Shoal; Union of California—Block 76, Vermilion; Pure et al—Block 76, Vermilion; and an unlisted company in Block 128, Eugene Island.

HERE IS the main building and two wings (rear view) of . . .

New Home Occupied by Union

UNION OIL CO. has provided Los Angeles with the largest weekend move in history.

In a $20,000 operation, 200 movers transferred every stick of furniture and piece of machinery from six scattered buildings to Union's new $22-million, 13-story home office on the fringe of the downtown area.

The move, which started Friday evening and ended Sunday evening, was conducted with the precision of a military landing. Everything from waste baskets to huge IBM machinery was tagged to indicate which building, floor and room it would occupy.

Monitors on each floor of the new and old buildings directed the piece-by-piece operation.

The center . . . The new Union Oil Center dominates the downtown Los Angeles skyline.

Located on a 5-acre site on the highest ground in the area, it overlooks the metropolitan area.

The center consists of a 13-story main building, two four-story wings extending westward, and a two-story cafeteria, lounge, and auditorium building to the east.

In all, the center has 426,000 sq. ft. of office floor area and 519,000 sq. ft. of parking space for 1,500 cars.

Among the facilities are a library, a small hospital, and Union's own private telephone system. The center has enough air-conditioning to cool 500 normal-size homes.

Radiation Cuts Rail Fuel Costs

THE USE of irradiated low-grade fuel oil in locomotives is saving Denver & Rio Grande Western Railroad the equivalent of 20 cents a share on its stock.

The railroad is now putting no specifications on the oil it buys. It has found, it says, that atomically treated fuel oil performs better than the highest-quality diesel fuels.

What's more, current research indicates that another saving of 10 cents a share may be possible through use of an irradiated mixture of fuel oil and powdered coal. Several problems must be solved, however, before this mixture is used on the road.

Ray McBrian, engineer in charge of D&RG research, says the mixture includes coal which is crushed to 200 mesh and then treated with waste products from atomic reactors.

The radiation process splits the finely ground coal into microns (1/25,000 in.) which is then mixed with fuel oil. The minute coal particles burn completely inside the cylinder and serve to increase the energy content of oil.

Also, thanks to atomic research, D&RG has operated some engines since 1949 without changing oil. Use of radiation to discover causes of engine wear resulted in this major saving.

The railroad's atomic power discoveries are the byproduct of an Atomic Energy Commission contract 3 years ago to do research on a nuclear-powered locomotive.

McBrian said D&RG scientists are convinced it is technically feasible to build a nuclear power plant which bypasses the steam cycle, but they aren't sure whether it would be practical.

The research is continuing into the possibility that locomotives might be made to run on waste fission products from government reactors. This would reduce the amount of heavy shielding otherwise required for a mobile unit.

LACT Rule Asked

by Shell in Texas to allow blanket use of systems.

SHELL OIL CO. asked the Texas Railroad Commission last week for a blanket permit to install its automatic custody transfer system wherever it wishes on its West Texas leases.

The application was generally regarded as an industry test to get administrative approval by the commission of LACT systems instead of the presently required procedure of holding a hearing in Austin on each individual project.

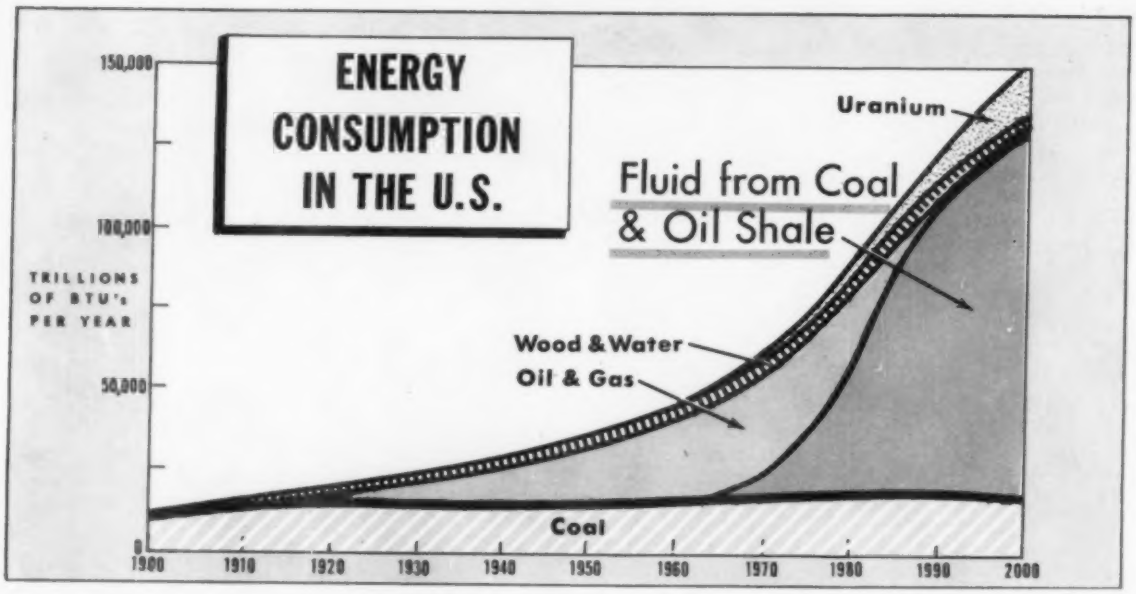
Shell specifically asked for a permanent permit to operate its Wasson field LACT system in Gaines County and any like it the company may install in commission Districts 7-B, 7-C, and 8.

Shell drew support at the hearing from Phillips Petroleum Co., Service Pipe Line Co., and Shell Pipe Line Co.

R. W. Jasper, mechanical engineer for Shell, testified that the Wasson system has measured and delivered oil to the pipeline accurately. There has been no transfer of oil over lease allowables nor any loss to royalty owners, he said. Likewise, the system has delivered no nonmerchantable oil.

Jasper estimated that 3,452 bbl. of oil from the Wasson leases had been saved during the past 8 months because of the LACT system. This oil would have been wasted using conventional transfer methods. Jasper also estimated that Shell saved about $40,000 in tankage by use of the system.

The Railroad Commission approved the Wasson field system February 25, 1957, under a temporary 6-month permit.



Shale, Coal Gas to Supplement Natural

GAS may still be supplying a large share of the world's energy needs centuries from now if basic and applied research is supported actively enough.

This bright future for gas will not necessarily be limited by availability of natural gas.

This is the prediction of Martin A. Elliott, director of the Institute of Gas Technology. He projected today's frontiers of science and technology into future gas operations in a paper prepared for the AGA management conference in Washington.

Elliott believes that in the not too distant future the bulk of fossil fuels will come from shale. Their use will make it possible to supply a huge proportion of the energy requirements with liquid fuels and still have 60 to 70% of recoverable reserves left by the year 2000.

Here are the possibilities of today's frontiers as Elliott sees them:

... Liquefied natural gas. The first tanker shipment of natural gas, scheduled for trial this year, eventually could make vast quantities of gas from the Middle East and Venezuela available to this country.

... Oil-shale gasification. Early basic research by the institute has shown that oil shale can be hydrogenated directly at moderate temperatures to give a net yield of 2,500 cu. ft. of high-B.t.u. gas per ton of shale.

FUTURE FOSSIL-FUEL RESERVES

	Total	Recoverable as primary fuel	Recoverable as fluid fuel	Cumulative U.S. energy demand 1958-2000
Coal	*20.5 Q	†5.1 Q	3.0 Q	
Crude petroleum	1.1 Q	0.5 Q	0.5 Q	
Nat. gas and nat.-gas liquids	1.3 Q	0.6 Q	0.6 Q	
Oil shale—				
Colorado	7.2 Q	4.9 Q	4.9 Q	
All other states	11.8 Q			
Total	41.9 Q	11.1 Q	9.0 Q	3.6 Q

*Q = 10^{18} B.t.u. = 10 trillion therms of natural gas (a sphere of natural gas 24 miles in diameter).

†An additional 6.2 Q could be recovered at 1.25 to 1.50 times present prices.

This clearly indicates that the gas industry can tap our enormous resources of shale oil as a potential source of high-B.t.u. gas in the future.

... Coal methanation. This process is sufficiently advanced that it could be used today. Coal is gasified to produce synthetic gas which is then purified and converted to methane in the presence of catalyst.

Coal can also be converted into gas by reaction with hydrogen at moderate pressures and elevated temperatures. Both processes are being examined further here and in Great Britain. The tests are expected to lead to more efficient, more versatile, and less costly ways for converting coal into high-B.t.u. gas.

... Nuclear energy. It is already apparent that many developments in the utilization of nuclear energy can be applied to gas production processes and gas-industry operations, both by radiation and heat. The Bureau of Mines and the AEC are working together to develop a gasification process using nuclear energy. The Armour Research Foundation has shown that coal may be depolymerized into simpler chemical compounds by gamma radiation.

... Solar energy. The photochemical decomposition of water into hydrogen and oxygen in the presence of ceric and ceroustions is one method. It promises a source of fuel that is dependent only on solar energy and water. Thus gas would be assured even in a nonfossil fuel era and the

industry's efficient economical transmission system would continue to be used at that point.

. . . Fuel cells. The fuel cell is the ideal ultimate means for converting chemical energy of fuels into electrical energy. Because of its low operating temperature and the direct conversion of chemical energy into electrical energy, the fuel cell has an over-all efficiency more than twice as great as the conventional steam power plant.

Since solid fuels create operating problems and inherently give lower efficiencies, fuel gases offer the greatest promise for the commercial development of the fuel cell. "This examination," Elliott said, "shows that the inherent advantages of energy in form of gaseous fuel—minimum transportation cost, storability, flexibility and cleanliness—are essential factors in many future energy conversion and utilization processes.

"We can conclude that today's scientific and technological developments foretell an extremely bright future for the gas industry."

Blowout in Texas

may mean good production at Pescadito salt dome.

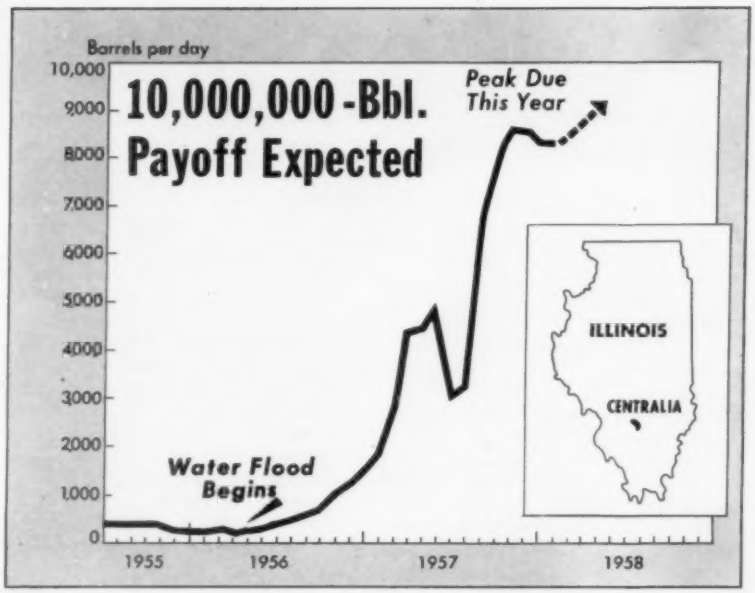
SOUTHWESTERN Texas' large Pescadito salt dome last week got some real indications of possible commercial production the hard way—a gas blowout in the deep wildcat test being drilled by Ginther, Warren & Ginther.

The wildcat encountered high gas pressures while drilling at 14,004 ft. The gas unloaded the full hole of drilling mud weighing 17.8 lb. per gal. and started blowing to the pits, where it ignited and burned for a short time.

Pressures were brought under control after 2 days by pumping mud weighing up to 19.2 lb. per gal. and then permitted to bleed off gradually.

Deepening of the hole to its original deep Edwards objective is being delayed by fishing operations required because of sticking of the drill-pipe during the blowout.

Gulf Oil Corp., Michel T. Halbouty, of Houston, and O. W. Killam, of Laredo, Tex., are associated with Ginther, Warren & Ginther in the well. The well is the Ginther firm's second deep test at Pescadito. The first test, drilled last year to 15,107 ft., failed to get production but proved the structure to be a gigantic salt dome. It is located about 15 miles northeast of Laredo.



Shell Boosts Centralia Output

A GOOD EXAMPLE of what water flooding can do for an ailing oil field is unfolding at Shell Oil Co.'s Centralia project in Illinois.

After less than 2 years of flooding one of the state's older fields, Shell and 27 other operators have already recovered more than 2,600,000 bbl. of oil from the Benoist and Cypress sands. They hope to coax up another 7,400,000 bbl. in the next 10 or 12 years.

Production from 113 wells has soared from a mere 240 bbl. daily when the program began in May 1956, to an average of more than 8,300 bbl. daily in February this year.

And the peak is yet to come. Expansion of the flood this month will push the output even higher. Shell, as operator of the Centralia unit, is adding 20 wells to the Cypress program in the southern part of the unit.

The unit covers 1,920 acres in the center of the 3,360-acre field just northwest of the town of Centralia. Shell owns more than 44% of the unit, with the rest divided among Sohio Petroleum Co., Gulf Oil Corp., and 25 other operators.

Push-button equipment . . . The latest surface equipment was installed to give the program a lot of flexibility.

The plants for oil treating and storage, water treating, and injection are completely centralized. Automatic testing units enable the operator to sample production and measure the water and oil being produced by any given well at any time (OGJ, Aug. 8, 1955, p. 68).

The automatic test can be set up to check every well in the unit at 12 or 24-hour intervals.

Water treatment is also automatically controlled. The injection system is electrically operated with pressure and emergency cutoff controls at a central point.

The pattern . . . Most of the flood is patterned on a 20-acre five-spot basis, with an injection well at each corner of a 20-acre tract and a producing well in the center.

The 112 injection points include 73 for the Benoist zone, found at 1,200 ft., and 39 for the Cypress, found at about 1,350 ft. In some cases, water is injected into both zones at the same well. About 80% of the production is from the Benoist and the rest from the Cypress.

In February this year injection averaged about 13,575 bbl. daily. When the new expansion in the southern part of the unit is completed, this will be increased to about 15,000 bbl. daily.

Old field . . . The boom in Centralia was sparked by Adams Oil & Gas Co.'s discovery in November 1937, which came in for 161 bbl. of oil daily from the Benoist.

In the drilling rush that followed 727 wells were drilled.

Cumulative production from all zones in the field at the beginning of the year was 41,656,000 bbl. (OGJ, Jan. 27, p. 164).

FPC Gets Constock Plan

. . . to ship gas abroad. Commission authority questioned. If tests succeed, supply will come from outside U. S.

EAST MOSS LAKE field in southern Louisiana will supply gas to be used in an experiment in moving liquid methane overseas.

But if the test is successful and regular service is started, the long-term supply will be secured outside the United States. This was disclosed by Constock Liquid Methane Corp. in papers filed with the Federal Power Commission.

Constock told the FPC that what it is now doing is purely experimental. An established business would have to draw on sources outside the U. S. "where larger quantities of natural gas can be procured from areas which have no local market outlet."

The company said it believes the project does not come under the Natural Gas Act. It asked the FPC to disclaim jurisdiction.

But if the commission holds that the U. S. facilities must be approved, the company, to avoid delay, asked formal permission to build, operate, and maintain them.

Constock also filed its plans with the U. S. Army Engineers at New Orleans (OGJ, Mar. 31, p. 52).

Three trips planned . . . The company's filing with the FPC explained that it wants to prove the feasibility and economy of storage and long-range transportation of liquefied hydrocarbons, principally methane.

It expects to need no more than 700,000 M.c.f. of gas for the test trips that are planned. There would be three such trips. Up to three additional trips will be made, if necessary, to prove or disprove the idea that overseas transport of liquefied gas is feasible.

The gas will be taken in England by the British Gas Council. Since the project is experimental and temporary, the price has not been set but will be reached by negotiation.

The British Gas Council now is building facilities near London for the receipt, storage, and distribution of the gas (OGJ, Dec. 16, 1957, p. 59).

Constock has leased a site for facilities for processing and shipping the gas on the Calcasieu River in Calcasieu Parish, Louisiana. Facilities will include a liquefaction plant, built on a barge to be moored at the site of operations, with dock facilities for an ocean-going tanker and insulated land storage tanks.

If successful, the FPC was told, the experiment will prove the feasibility and economy of storage, transportation, and handling of liquefied hydrocarbons at low temperatures. It would provide a means to materially add to the fuel supply of Great Britain and other countries remote from gas supply areas, it was explained.

At the same time, it would make possible the importation of liquefied gas into the U. S. from remote areas of supply, should need for this arise at some future time.

Jury Investigates Phone Calls

THE ALEXANDRIA, Va., federal grand jury investigating last year's oil price increase is searching telephone company records this week for support of the Government's charges of antitrust violations.

Officials of seven telephone companies have been called by the Justice Department to testify and submit records relating to telephone calls between officials of 34 oil companies from December 15, 1956, to January 18, 1957.

Virtually all the oil companies also have been asked to testify regarding intercompany telephone talks during the period immediately prior to the January 1957 price increases.

The inquiry is due to wind up in just 2 months. The life of the grand jury expires early in June.

Need Dry Ice?

Deep Smackover test yields almost pure carbon dioxide.

CARTER Oil Co. got a strong flow of unwanted carbon dioxide gas in the deep Smackover wildcat it is drilling in northeastern Rankin County, Mississippi.

Flow through ⅜-in. chokes last week was estimated at 6,000,000 cu. ft. per day. It was a drill-stem test of open hole in the Smackover formation at 14,494-14,524 ft.

Gas tested 99.19% carbon dioxide, 0.68% air and nitrogen, and 0.13% methane.

The hole, previously cased to the top of the open-hole section tested, has been deepened to 14,852 ft., where additional tests are showing carbon dioxide.

The wildcat, 1 Kersh, is 25 miles northeast of Jackson. It is 15 miles southeast of Mississippi's only Smackover production—Loring field—where Carter has two hydrogen sulfide gas wells.

PROCESSING BRIEFS . . .

The Texas Co. has put on stream a new 80,000-bbl. per day vacuum pipe still at its Port Arthur, Tex., refinery. The unit will replace old facilities having a capacity of 60,000 bbl. daily, giving the refinery a rated crude capacity of 250,000 bbl. a day.

Atlas Processing Co., Shreveport, has not been purchased by American Petrofina as was erroneously reported in the Journal's refinery construction survey (OGJ, Mar. 24, p. 200). Petrofina has taken over assets of Petro-Atlas Corp. and El Dorado Refining Co., and gas subsidiaries of Atlas Corp.

Anderson-Prichard Oil Corp.'s new propane deasphalting unit at its Arkansas City, Kans., refinery has been placed on stream. The unit has a capacity of 1,200 bbl. daily.

The Texas Co. plans to build a multimillion-dollar shale-oil research laboratory in Salt Lake City. Construction will not start this year, although land for the project has been purchased. Texaco has large shale holdings in the Piceance Creek area of western Colorado.

D-X Sunray Oil Co. has closed out the last of its blending operations at its now-obsolete refinery at Allen, Okla. The remaining facilities at the plant, which was built in the 1920's, will be left intact for the time being. D-X has two other plants in Oklahoma—a 75,000-bbl. refinery in Tulsa and a 45,000-bbl. plant near Duncan.

Esso Research & Engineering Co. has developed a new synthetic rubber that can readily withstand high temperatures and is compatible with both synthetic and natural rubbers. The new MD 551 possesses some of the advantages of butyl, including superior air-holding and antiozone resistance. It is also resistant to distortion and has a faster curing rate.

The company is considering building a 3-ton plant to manufacture MD 551. Development was carried out at

Washington Test

in Benton County going deep; one more test now drilling.

STANDARD OIL CO. of California is below 10,156 ft. in a Washington State wildcat test that was suspended December 31 and reopened in February.

The 1 Rattlesnake Hills Unit is on a 106,000-acre block 15 miles north of Prosser in Benton County.

No depth objective has been announced, but already the well is Washington's second deepest. The deepest hole, a dry one, was drilled to 11,002 ft. by Socal in 1947. It was the 1 Alderwood in Snohomish County.

The current test went to 8,418 ft. before it was suspended at the close of 1957.

Washington has one commercial producer—Sunshine Mining Co.'s 1 Medina, a Grays Harbor County wildcat discovery of last year. Production now averages 25 bbl. per day.

In addition to Socal's test in Benton County there is one other active location in the state. It is the 1 Sylvester Gunther, now drilling below 2,440 ft., 10 miles southeast of Chehalis. Objective is the Eocene at about 8,000 ft. Pleasant Valley Gas & Oil Co., and others, are drilling the test on a farmout from Continental Oil Co.

BA's Port Moody Refinery Progresses

BRITISH AMERICAN Oil Co.'s new refinery at Port Moody, B. C., near Vancouver, is beginning to take shape. The 20,000-bbl. refinery will have a 9,000-bbl. vacuum unit, a 13,500-bbl. fluid catalytic cracking unit, a 4,000-bbl. Atlantic Catformer, a 1,000-bbl. sulfuric-alkylation unit, and a 7,200-bbl. hydrogen-treating unit.

The refinery is scheduled to go on stream in November. Work has progressed on schedule despite heavy winter rainfall. Canadian Kellogg, Ltd., is building the refinery.

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a 1-ton plant in Baton Rouge, La. Expected uses will be in truck tires, white sidewalls, retreads, inner liners for tubeless tires, high performance rubber mechanical goods, and products subject to high temperatures, such as curing press bladders, steam hose, conveyor belts, and wire-installation materials.

British American Oil Co., Ltd., will build a products terminal on the north side of Bedford basin at Burnside, Nova Scotia. The terminal, with initial storage capacity of 9,000,000 gal., will be the first for British American in Nova Scotia and the company's largest distribution center in the Atlantic provinces. The company will soon call for bids for construction of buildings and storage tanks.

Tetraethyl-lead prices last week were cut 0.5 cent a pound by the Du Pont Co. Du Pont set the price of its motor mix compound at 36.69 cents per pound, equivalent to 59.68 cents for TEL alone. Previous price was 37 cents, equivalent to 60.18 for TEL. The change was effective April 1. Other new prices are motor mix "A," 36.28 cents, and aviation mix, 40.27 cents.

Effective April 1 Ethyl Corp. has reduced price of tetraethyl lead half cent per pound. New prices are motor mix, 59.68 cents; motor plus, 60.88; and aviation mix, 65.58.

Richfield Oil Corp. has started engineering design work on a 37,200-bbl. crude topping unit to be built at its refinery in Watson, Calif. The unit will boost the refinery's capacity to 174,000 bbl. daily. Completion is slated for mid-1959. Construction of a petrochemical plant producing 18,000,000 gal. of benzene and toluene is nearing completion at the refinery.

Construction will start soon on Esso Research & Engineering Co.'s new facilities at Florham Park, N. J. The first stage, three main buildings, is expected to be completed by late summer of 1959.

Also for Refiners . . .

IN THE NEWS: Battle over imports expected after Congress returns from Easter recess. Ikard plan to auction off import licenses will spark the battle (p. 101) . . . Imports for February hit a modern low (p. 102) . . . Texas is bearing the brunt of the industry's efforts to cutback production to end oversupply (p. 103) . . . California Research has developed a process which they claim will cut in half catalyst-replacement costs for moving-bed cat cracking units (p. 105) . . . Radiation of fuel results in big saving for railroad (p. 109).

PLUS THESE TECHNICAL REPORTS: Refinery construction index (p. 147) . . . Tips on refining problems (p. 157) . . . Quarterly costimating report (p. 165).

New Cement to Improve Wells

. . . in clay zones by suspending water droplets in oil-base cement slurry. Magnolia gets good results in field testing.

MAGNOLIA PETROLEUM CO'S. big field research lab near Dallas has come up with a new inverted emulsion cement which it thinks can benefit half the wells in the U. S.

The cement was unveiled by Magnolia scientists March 25 to help celebrate the lab's twentieth anniversary and completion of a large new building on the lab grounds.

At the same time Magnolia announced a new technique using television to improve seismic records (see below).

The use of emulsion cements, in which droplets of oil are suspended in a primary water-cement slurry, is not new in oil-well cementing. But an inverted emulsion, with water droplets suspended in an oil-base cement slurry, is new to the industry.

The Magnolia cement suspends water in diesel oil. When the cement is added, the slurry remains in the oil phase, and the typical cement-water reaction does not take place.

The emulsion stands up until it has been pumped into position in a well. The higher down-hole temperature then slowly breaks the emulsion, the cement contacts the water, and the mixture hydrates normally.

Formation damage cut . . . The new cement should prove highly helpful, Magnolia thinks, in cementing zones containing clay.

Water in conventional cements causes clays to swell and to seal off pore space in the rock thus restricting oil flow into the well bore, the company says. The inverted-emulsion cement slurries show practically no water loss to porous formations, where regular cements lose water rapidly.

Use of this cement, Magnolia claims, in water-sensitive oil zones hitherto damaged by invading cement fluids can enable operators to produce such zones at near-maximum rates.

Dr. C. I. Alexander, lab manager, estimates that half the fields in the U. S. contain clay or other materials "allergic" to water-based muds and cement. "And these can all benefit from use of the cement."

Along with the formation-damage aspect, Magnolia lists these other strong points for the cement:

. . . No premature setting. This is sometimes encountered in normal cementing operations.

. . . High pump rates.

. . . Slurry can be stored at the surface for considerable periods without setting.

Alexander said Magnolia has field tested the new cement extensively with good results. The product is not yet on the market, but it may be soon. Magnolia is negotiating with several service companies for licensing the cement and a sister product, an inverted drilling mud the company introduced 2 years ago.

Lab facilities . . . The laboratory's new one-story building will add about 25,000 sq. ft. of new research floor space.

It will house chemical and physical laboratories with associated offices, a digital computer, library, instrument shop, electronics shop, and photographic library. It is constructed to accommodate a second floor which probably will be added about 1960.

The huge Magnolia research plant now boasts a 380-man staff, compared with just one scientist 20 years ago. Research work is carried out in 25 buildings on a 144-acre tract just southwest of Dallas.

The lab has borne the brunt of the exploration and production research effort of Magnolia and all other Socony Mobil companies around the world since 1946. Between 1938 and 1946, its function was product research.

Television Helps Read Seismograms

THE WRAPS are off a newly-developed system that uses television to help filter "static" from seismograms.

Magnolia Petroleum Co.'s geophysical-research staff has released information on the system, under which field seismograph tapes are now being run through a central play-back facility at the company's laboratory near Dallas.

The signals are passed through electronic filtering circuits to a TV monitor and then rerecorded on paper. A lab technician seated before a control panel with a 21-in. TV screen filters out static by adjusting a series of dials. The "processed" paper seismogram can be read and interpreted much faster and easier.

The Magnolia lab has been receiving troublesome "foggy" seismograms for such processing from exploration sections of Magnolia and its affiliates all over the world.

The TV process does away with the former trial-and-error method of photographing and developing a number of paper records to find the best one.

CB&I Serves Million Dollar Bunkering Terminal at historic GATEWAY TO THE FAR EAST

331,500 barrels of fuel oil and marine diesel oil are stored in four Horton® cone-roof tanks at Stanvac terminal. CB&I also installed a water storage tank, piping, manifolding, pumps, as well as loading and unloading facilities. This facility gives Aden a third bunkering terminal—to make Aden one of the world's largest and busiest ports.

Firm of Sir Bruce White, Wolf Barry & Partners, London, were engineering consultants.

Where there's petroleum and the need for petroleum storage or process equipment . . . you'll find CB&I.

Off the tip of Aden Peninsula, where Suez Canal shipping starts its voyage to the Far East, CB&I played an important role in the construction of this million dollar bunkering terminal for Stanvac.

An unusual installation yes, but a good example of how CB&I's expertly coordinated services can be made available to meet the most *specific* set of requirements. CB&I's *global representation* serves a world of petroleum with the advantage of *one* source and *one* responsibility for services including design, engineering, fabrication and erection of steel tanks and processing structures . . . for erection *anywhere*.

Write your nearest CB&I office for further details.

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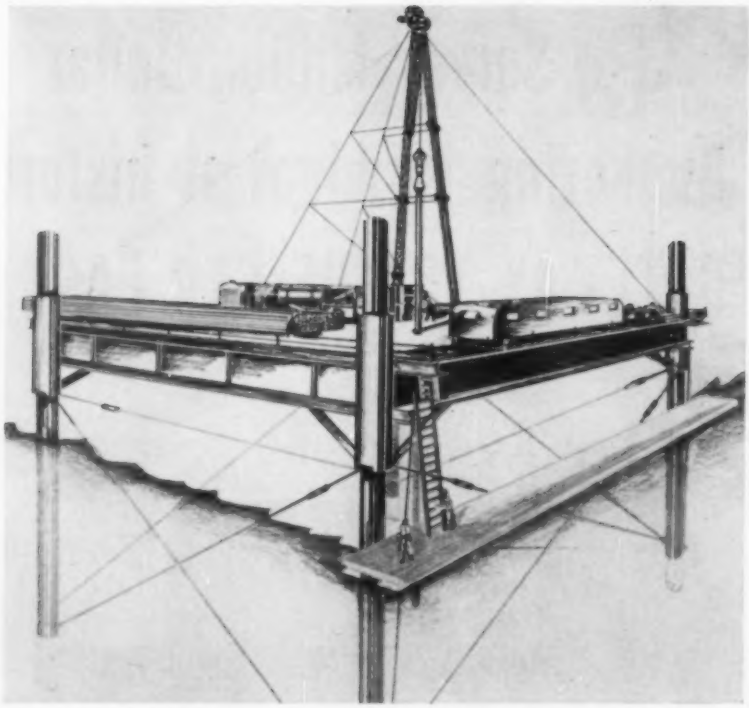

NEW PLATFORM is designed for drilling off Pennsylvania where . . .

Lake Erie Test Is Scheduled

THE FIRST OFFSHORE well on the U. S. side of Lake Erie will be drilled off the coast of Pennsylvania by New York State Natural Gas Corp. sometime this spring.

The company is assembling a special drilling platform to test its choice 35,710-acre offshore concessions acquired from the State of Pennsylvania last fall for an annual rental fee of $90,917.

Dravo Corp., which is building the platform at Erie, Pa., expects to complete construction by April 30. Drilling will start within 60 days after that.

The first wildcat, which may go to 6,000 ft., will be located in Block 1, a 19,130-acre tract near the Ohio border (OGJ, Aug. 26, 1952, p. 71). New York State Natural paid $3.79 per acre annual rental for this lease. Onshore operating base will be at Conneaut, Ohio.

The company also plans to test the 16,580-acre Block 2 near the New York border. This tract was acquired for $1.11 per acre annual rental fee. The customary 12½ % royalty will be paid the state if production is found on either block.

Mobile platform . . . The new platform will probably cost the company in excess of $500,000. It will be about 50 ft. square and will consist of five pontoons pinned together. Legs at each corner will be of tubular pipe. Each of the pontoons is welded steel and measures 50 ft. long, 10 ft. wide, and 8 ft. deep. The legs are 36 in. in diameter and 130 ft. long.

The corner legs, which project above water during towing, will be dropped to lake bottom when the barge reaches drilling site. Two 100-ton hydraulic jacks at each leg will raise the platform about 25 ft. above water.

Drilling procedures will be similar to those on land except that the well will be completed on the lake bottom. The cellar, master gate, christmas tree, and piping must be installed on the lake floor by divers. Both blocks are in 30 to 50 ft. of water.

Cable tools will be used in preference to rotary equipment, which would require a larger and more costly platform.

No drilling is to be done closer than ½ mile from shore. The average maximum will be about 6½ miles from shore. Drilling in the lake is limited by ice formations and frigid winds. The drilling season corresponds roughly to the navigation season—about April 15 to November 15.

Favorable geology . . . Geologists consider the area an excellent drilling prospect.

Ohio's great Clinton-Silurian belt of fields extends to the lake. Gas fields south of Buffalo in New York and Ontario's Silurian fields on the Niagara Peninsula rim the water. Geologists believe the trend extends across the shallow lake in one great Silurian belt.

The company's geologists expect to find gas in any of five formations: Oriskany, Lockport, Medina, Trenton, and Gatesburg. The Oriskany is found at about 1,500 ft. in the area, and the Gatesburg at about 5,780 ft.

The Medina is regarded by some as the most likely producing formation. Gas has been found in the Medina in Ohio, and oil is produced from this sand in the vicinity of Niagara Falls.

The possibilities for Oriskany production are also good. This zone is the major gas-producing formation in the New York-Pennsylvania-West Virginia area (OGJ, Sept. 30, 1957, p. 66).

Although New York State Natural will be the first firm to drill offshore on the American side of the lake, drilling on the Canadian side dates back to 1913 when gas was found 300 ft. offshore. By October 1957, 78 wells had been drilled in Lake Erie on the Canadian side.

New York State Natural is the biggest operator in Pennsylvania. In addition, the company has extensive distribution facilities.

Products Line Planned

PLANS ARE being made to build a 6-in., 300-mile products pipeline from Amarillo, Tex., to Albuquerque, N. M. The cost will be about $4 million.

The line will be owned in equal

shares by Emerald Pipe Line Corp., Shamrock Oil & Gas Corp. affiliate, Phillips Petroleum Co., and The Texas Co. Completion of the Amarillo to Tucumcari, N. M., link of the pipeline is expected July 1, with the Tucumcari-Albuquerque link to open about September 1.

Capacity will be about 25,000 bbl. a day.

More Prices Cut

by crude buyers in Texas, Oklahoma, Illinois basin.

THE PRICE TAG on crude in Texas, Illinois, and Oklahoma was adjusted downward by more buyers last week.

Companies and areas involved:

... **Magnolia Petroleum Co.** cut 10 cents a barrel from 16,000 bbl. of Oklahoma sweet crude, making new top $3.05; also 15 cents a barrel from 9,200 bbl. of Seeligson crude in South Texas, making new top $3.20; sliced 7 cents a barrel from 23,000 bbl. of North Texas crude now topped at $3.08; and 7 cents a barrel from 16,000 bbl. of Scurry County crude also with a new top of $3.08.

Magnolia also devalued high-gravity crude in West Texas and New Mexico. It placed the crude on a top scale of $3.08 for 44.9° gravity with a 2-cent differential downward for each degree to $2.86 for 55° gravity.

... **Atlantic Refining Co.** reduced prices in Southwest Texas and the Gulf Coast. It cut Refugio-heavy type crude 15 cents a barrel; Refugio-light type by 20 cents; and Aransas and Mustang Island type by 10 cents. In addition, Atlantic cut the price of condensate in the same region by 15 cents a barrel.

... **Indiana Oil Purchasing Co.** cut 18 cents a barrel off the price for High Island crude on the Texas Gulf Coast. New top will be $3.40 per bbl. Indiana also penalized high-gravity crude in West Texas and New Mexico with a 2-cent differential downward from a top of $3.08 for 44.9°-gravity oil.

... **Shell Oil Co.** reduced the price for Illinois basin oil by 15 cents a barrel and the price for Oklahoma sour crude by 10 cents. In both instances the changes met previous reductions by other buyers.

Meanwhile, Richmond Exploration Co. cut 18 cents a barrel from the price of Boscan crude. The new posting is $1.72 bbl. for 10°-gravity oil loaded at Bajo Grande, Venezuela. The heavy Boscan crude is used mostly for asphalt.

Carson Heads OOG

in new assignment. He'll keep import-control duties.

CAPT. M. V. CARSON, Jr., administrator of the oil import program, took on a second job in the Interior Department last week as director of the Office of Oil and Gas.

Carson will continue to head the voluntary oil program, Sec. Fred A. Seaton said. He will serve in both posts on assignment from the Navy.

Meanwhile, Carroll D. Fentress, assistant director of the OOG, will follow his former chief out of government service April 30. Fentress sent his 30-day resignation notice to Seaton at the close of March. Hugh A. Stewart, former director, resigned February 28.

First assigned to the Petroleum Administration for War, Fentress stayed on with its successors Oil and Gas Division, Petroleum Administration for Defense, and OOG.

The Oil and Gas Division was established "as an experiment in the belief that continuation in peacetime of the World War II government-industry teamwork . . . would be of benefit to the economy and security of our nation," Fentress told Seaton.

"During the almost 12 years which have elapsed, my efforts have been directed toward making this experiment in economical government a success . . ."

Seaton said last week he expects a decision soon on the chairmanship of the National Petroleum Council.

"The council is engaged in work important to the Government," Seaton said. "We would like to get the question resolved and get on with the work."

——*Industry* briefs

Seaboard Oil Co. stockholders will hold a special meeting, probably the latter part of May, to consider the proposed sale of Seaboard to The Texas Co. Each Seaboard stockholder would receive one share of Texaco stock for each share of Seaboard stock.

Texaco has held about one-third of Seaboard's stock since 1933 and currently buys about two-thirds of Seaboard's domestic crude production of 37,000 bbl. daily. Value of the two-thirds not held by Texaco is about $145 million (OGJ, Feb. 3, p. 62).

La Gloria Oil & Gas Co. has announced plans to move its general offices from Corpus Christi to Houston. The move, involving about 100 persons, is scheduled to begin in June. The company is a subsidiary of Texas Eastern Transmission Corp., which acquired it through a stock exchange last year.

Kansas' oil allowable for April has been set at 305,000 bbl. a day—a decrease of 5,000 bbl. from the March figure. The state corporation commission followed the recommendation of its conservation director, Jewel M. Ogden, in trimming the oil production. Ogden reported that purchasers' bids for April crude totaled 290,806 bbl. daily, a drop of 9,204 from March.

Sivalls Tanks, Inc., has signed a licensing permit with Phillips Petroleum Co. for the manufacture and marketing of Phillips-developed automatic custody transfer equipment. The equipment was originally designed by Phillips for company production leases in Oklahoma, Texas, and Utah. Sivalls manufactured many of the vessels for these units at its Odessa, Tex., shop.

Canada's deepest flowing well is making 5 bbl. of oil daily from the Dalhousie section of Lower Cretaceous in the Stavely district 58 miles south of Calgary. The producer, the 5-12 BA-Baysel Willow Creek, was drilled to total depth of 11,207 ft. by British American Oil Co., Ltd., to test the Mississippian.

But the hole was abandoned when the lower zone was found unproductive. Bailey Selburn Oil & Gas, Ltd., took over the operation to fully test the Dalhousie at plug-back depth of 10,800 ft. The company is to receive twice the cost of completion from initial production.

Midwest Gas Plans Hit

. . . by FPC attorneys. Brief cites defects in applications by four firms. Midwestern plan called "best in concept."

PLANS of four big pipelines to extend gas service into the Midwest ran into a road block in the Federal Power Commission last week.

None of the applications filed by Midwestern Gas Transmission Co., Natural Gas Pipeline Co. of America, Michigan Wisconsin Pipe Line Co, or Northern Natural Gas Co. meets the standards of the Natural Gas Act, Staff Counsel Harry L. Albrecht and Richard C. Steffey asserted.

"All of these applications should be denied on the basis of the showing made on the record," counsel said in a 176-page brief.

The two lawyers said they reached this conclusion "reluctantly." The markets in the area "not only deserve natural-gas service, but there is every reason to believe that a solidly feasible project can be put together," they declared.

The struggle for the big Midwest market involves nine companies who filed 20 applications with the FPC between October 1955 and March 1957. The applications were packaged for omnibus hearings which ran 143 days.

Other companies with an interest in the issue are American Louisiana Pipe Line Co., El Paso Natural Gas Co., Permian Basin Pipeline Co., Iron Ranges Natural Gas Co., and Tennessee Gas Transmission Co.

The facilities sought by the principal applicants total some 6,600 miles of pipelines and 355,000-hp. compression facilities with an estimated cost of $621 million.

Here is a summary of what the several companies seek:

. . . **Midwestern,** with plans for pipelines from Canada and Tennessee, would reach into competitive markets. The brief does not cover an application filed last month for a $45-million pipeline to serve the Chicago-Gary area (OGJ, Mar. 24, p. 92).

Midwestern's project is supported by TGT, its parent and gas supplier.

. . . **Michigan Wisconsin's** project also relates principally to the competitive markets.

. . . **Northern Natural's** proposal is divided between competitive and noncompetitive areas and additional service to existing customers. Its applications were supported by El Paso and Permian Basin Pipeline.

Defects cited . . . The FPC lawyers conceded that Midwestern's proposal "is very clearly the best in concept." It would put a new large-diameter pipeline through the heart of the unserved areas in Minnesota and Wisconsin and provide large new volumes of gas.

"But starting from this bright promise, Midwestern's project cannot stand up under scrutiny," the brief asserted.

"Since it is one, indivisible project, it falls because it includes the totally unwarranted and unjustified proposed firm direct sales to the steel companies in the Chicago area. Then, by circumstance, it lacks an assured supply of gas from Canada, also a fatal defect. And finally, and by no means of minor importance, Midwestern's project falls substantially short of being economically feasible."

Natural's proposal also was held to be defective because of proposed industrial sales, but also because, it was charged, it is not adequately serving its existing market and lacks an adequate supply of gas.

Michigan Wisconsin's plan was rejected because the comparatively small additional service proposed would cause an increase in rates to existing customers. Its showing in support of its proposal "is easily the worst among the four competing applications, and deserves scant attention," staff counsel commented.

Northern Natural should be turned down because of alleged dependence for one-third of its expanded capacity on its Redfield storage, which has not been shown to be capable of such large withdrawals for any appreciable length of time, the FPC was told.

New deal doubtful . . . The FPC, meanwhile, has given interested parties 10 days in which to comment on last month's proposals of Midwestern and TGT to sell 260 million cubic feet of gas daily to the Illinois-Indiana area beginning next January 1.

Midwestern's proposal (OGJ, Mar. 24, p. 92) was a substitute for that part of its original project involving a pipeline from Portland, Tenn., to Joliet, Ill. TGT's filings included applications which would provide the gas for the new service.

The two companies asked for temporary certificates by April 15 in order that the projects may be built and put into service next January 1. The FPC, however, says that it appears "improbable" that it will be in a position to take action prior to April 15.

The commission has not yet de-

PIPELINE BRIEFS . . .

Pacific Northwest Pipeline Corp. plans to spend $5 million this summer for construction of additional laterals to connect Wyoming's Big Piney-LaBarge field with its natural-gas system. In addition, $1 million is earmarked for construction of a scrubbing plant near Opal, Wyo.

Buckeye Pipe Line Co. will extend its eastern products system with a 50-mile, 10-in. line from north of Syracuse to shipper terminals at Utica, N. Y. This $2,800,000 project will give the Utica area its only products line.

Construction is to begin this spring on a Florida products line in which Buckeye has 46% interest. It is the 10-in. Everglades Pipe Line Co., which will extend from Port Everglades on Florida's east coast to the Miami International Airport. Other owners are Cities Service Co., 44%, and Pure Oil Co., 10%. Buckeye is construction and operating agent.

Buckeye has temporarily postponed a 70-mile, 8-in. products line from the Detroit area into central Michigan, pending further evaluation of terminal locations by shippers.

Arkansas Louisiana Gas Co. plans to inaugurate on-stream pigging to increase efficiency of its 200-mile Carthage, Tex.-Malvern, Ark., pipeline. Installation of scraper traps, filters, and separators is expected to raise capacity of the line by 10 per cent. Arkansas Louisiana engineers estimate the $477,000 improvement program will achieve the same throughput increase as $1,100,000 spent on looping. And looping would offer no guarantee of a permanent increase in efficiency.

Michigan Wisconsin Pipe Line Co. plans to lay 148 miles of pipeline this year to connect new supplies in Oklahoma and to loop part of its main line. A 56-mile, 20-in. extension will be built from the main line to Laverne field in Northwest Oklahoma. A gathering system also will be built in the Laverne area. The main line will also

cided whether to accept the filings. It pointed out that it announced in March 1957 that no additional filings in the consolidated cases would be accepted. The FPC now says that it sees no alternative to treating the new applications as including requests in the nature of motions to amend the order.

Any action taken on the new Midwestern-TGT filings is expected to be extended to applications of Northern Natural and Permian Basin, which were rejected in February.

Gas Spending Forecast

THE GAS INDUSTRY will have to spend $14 billion for transmission facilities and $11.5 billion for distribution plant in the next 12 years to serve the 43.7 million customers foreseen in 1970.

This target was laid before the industry last week by C. S. Stackpole, managing director of the American Gas Association, at the opening of the fourth annual general management conference.

Stackpole, looking into the future, forecast a potential sale of 300 million gas appliances by 1975. But, he added, there is the Memphis decision, "with its threat to our vitally necessary expansion," and the Harris gas bill, which is needed to avoid the possibility of unnecessary regulation, as uncertain factors.

Pipeline Building Slows Down

THE NATION'S crude and products pipeline network will be stretched by more than 4,000 miles this year at a cost of nearly a quarter-billion dollars.

But this will be some 20% less line than was completed in 1957 and only a little more than was finished in 1956. However, the cost will be 25% greater than last year and well over double the 1956 total, according to the figures from the Committee for Oil Pipe Lines.

Pipeline conversions will be at a low ebb this year. The 398 miles now scheduled contrasts with 1,906 miles last year and 1,232 miles in 1956.

New crude lines to be completed this year will total 2,310 miles. With additional equipment on existing lines, the cost will exceed $131 million.

The principal products lines to be added will run 1,869 miles. They will cost $113.7 million.

The biggest project to be finished this year is the 723-mile crude line from the Four Corners area to Los Angeles, the committee says. The line, which will go on stream this month, will have a capacity of 70,000 bbl. daily and will cost $50.5 million.

Another $50 million will go into four other crude lines:

. . . **Texas-New Mexico** Pipe Line Co.'s 512-mile, 50,000-bbl. line from Aneth, Utah, to Jal, N. M., to cost $25 million.

. . . **Jayhawk Pipe Line Co.'s** 242-mile, 43,000-bbl. line from Meade to McPherson and Wichita, Kans., $10 million.

. . . **Shell Pipe Line Corp.'s** 120-mile 70,000-bbl. line from the offshore Louisiana production area to Norco, near New Orleans, $10 million.

. . . **Sinclair Pipe Line Co.'s** 149-mile, 130,000-bbl. line from Mexia to Houston, Tex., $7.8 million.

Products lines . . . A $50-million project also heads the list of products lines. Laurel Pipe Line Co.'s 440-mile line from Philadelphia to Cleveland will have a daily capacity of 100,000 bbl.

Two other products lines will carry a cost of more than $10 million:

. . . **Underground Storage** & Exploration, Inc.'s 393-mile line from Moundsville, W. Va., to Newark, N. J., will have a capacity of 125,000 bbl. of LPG. It will cost $26 million.

. . . **Ohio Oil Co.'s** 262-mile, 90,000-bbl. line from Wood River to Chicago will cost $10.8 million.

The single conversion now listed for this year will switch Cherokee Pipe Line Co.'s 398-mile, 10-in. line from Tulsa to Wood River from crude to products, the committee reported.

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be extended with 25 miles of 12-in. and 21 miles of 24-in. loops in Michigan and Wisconsin.

Nine intermediate stations of 3,500-hp. each will be built, together with a 3,600-hp. unit in Wisconsin. The installations will be completed by October 1 if FPC grants early approval.

Hearings on the expansion are scheduled April 21.

National Transit Co. is adding two new 125-hp. pumping units to its Pennsylvania crude system. Company personnel are making the installations at the Hudson and Titusville stations. The projects will be completed by July 1.

Peoples Natural Gas Co. will build 81 miles of 10, 12, 20, and 24-in. gas line in Pennsylvania this year and install a 500-hp. compressor unit in Armstrong County. Fifteen miles of the work is under contract to Reese Construction Co. and Reason Construction Co. The various projects are to be finished between now and September.

Union Oil Co. of California will lay three short loading lines from Los Angeles refinery and wharf facilities to a proposed outer harbor terminal. Union will build a 1-mile, 30-in. crude line, a 2-mile, 12-in. bunker-fuel line, and a 4-mile, 12-in. crude and bunker fuel line. A 1,100-hp. pump station will be installed at the terminal.

Commonwealth Natural Gas Corp. plans to build 28 miles of 12 and 18-in. pipeline in Virginia before fall. A 16-mile, 12-in. line will be laid from Waverly to near Wakefield and 12 miles of 18-in. from Chester to the Petersburg compressor station. The 12-in. is to be completed by July and the 18-in. by September.

Toronto Pipe Line Co. will complete by April 1 an 18-mile, 4-in. crude line from fields in Cheyenne, Morrill and Banner counties, Nebraska, connecting with Platte Pipe Line Co.'s 20-in. line at the Redding, Neb., station. H & B Construction Co., Sterling, Colo., has the contract.

Also for Pipeliners . . .

IN THE NEWS: FPC will resume hearings April 15 on Transcontinental Gas Pipe Line expansion program (p. 108) . . . Gas from shale and coal will supplement natural gas to supply world's energy needs in years ahead (p. 110) . . . Louisiana gas will be used in experiment to ship liquid methane to Europe (p. 112) . . . FPC staff ruling hits plans of pipeline firms to move into Midwest markets (p. 118) . . . Tempo of nation's pipeline building is slowing down (p. 119) . . . Pipeliners are looking hard for ways to cut costs (p. 124).

PLUS THESE TECHNICAL REPORTS: Middle East pipeline economics changed by unattended stations (p. 125) . . . Use of LACT is picking up speed (p. 133) . . . How dispatchers can help cut operating cost (p. 140) . . . Contracting for maintenance is becoming widespread among pipelines (p. 181).

Iran Oil Future Bright

. . . as country celebrates 50th anniversary of discovery. Annual report shows industry recovered and is thriving.

THE ANNUAL REVIEW of Iran's thriving oil industry came as cream for the coffee during the country's celebration of the fiftieth anniversary of its first oil discovery.

Iranian Oil Exploration & Producing Co. and Iranian Oil Refining Co. turned in a report that showed the country is no longer a sick sister among Middle East producers, suffering from the effects of the nationalization of the early 1950's.

The patient has recovered, and the future looks brighter than ever. Here are some of the reasons:

. . . **The 716,000 bbl.** daily net crude production was an all-time high, and a gain of 33.6% over 1956.

. . . **Runs of 314,000 bbl.** daily at Abadan refinery were up 34.2%.

. . . **A 40,000 bbl.** daily well, Agha Jari 48, was rated the second best producer ever completed in Iran.

. . . **A 450,000 bbl.** daily future for Gach Saran field is planned under a long range development program. The field, held back to 48,000 bbl. daily last year, will be served by a large pipeline to a new major loading terminal on Kharg Island in the Persian Gulf.

. . . **Iran collected** $213 million in cash, or in oil payments in lieu of cash, as revenue from oil exports. Another $42 million in foreign exchange was spent in the country to meet operating expenses.

Development continues . . . National celebrations got off to an early start in observance of the birthday of Masjid-I-Sulaiman, brought in May 26, 1908. The old field still averaged 41,000 bbl. daily last year. Nineteen wells were flowing at the year's end.

But the most significant development for the future is the success of development drilling in Agha Jari. Besides the No. 48, drilled entirely by an Iranian crew, the No. 47 was completed as a producer of 24,000 bbl. daily, and No. 30 proved a substantial northwest extension of the field.

Agha Jari is the mainstay of Iran's production. It averaged 450,000 bbl. daily last year, with 22 of 36 wells on production at the year's end. When a new 150,000 bbl. daily gas-oil separation plant, and a 16-20-in. pipeline to Bandar Mashur are completed this year, the field's capacity will increase to 600,000 bbl. daily.

Select Kharg Island . . . After a study of several site possibilities for the terminal of a 26, 28, and 30-in. pipeline from Gach Saran field, the decision has gone in favor of Kharg Island.

The 90-mile line will include a 23-mile section under the sea. The onshore section, extending to a point on the coast south of Ganeveh, will be buried a minimum depth of 2 ft.

The island provides shelter from northwest storms in the Persian Gulf. It has deep water close to the southeast shore, where the terminal will be located. There is space for an airstrip, and for a tank farm at an elevation which will permit gravity loading of tankers.

Initial design capacity of the line is 370,000 bbl. daily. The elevation of Gach Saran, 2,550 ft., will permit gravity flow to Kharg Island. At this volume of throughput, the tanker terminal will be able to handle vessels of over 100,000 tons.

Australia Refinery Planned

THE AUSTRALIAN branch of Standard-Vacuum Oil Co. has announced plans for a 24,000-bbl. refinery at Adelaide, South Australia.

The $36-million plant will be built 15 miles outside of Adelaide, between Hallett's Cove and Christie's Beach. The location will permit tankers of up to 80,000 tons to unload within 1 mile from shore. Stanvac now has a 29,200-bbl. plant at Altona, near Melbourne.

The proposal was announced jointly by the company and Sir Thomas Playford, premier of South Australia. It was one of several industrial developments made public recently which are to be built in the province over the next several years.

Building A Line Over Mountains

PETROGAS, S. A., a Venezuelan engineering and construction firm, is blazing a trail across the mountains with a 207-mile, 26-in. gas line from Anaco fields west to Caracas.

Until the contractor built access roads, these mountains were cut only by burro trails for much of the distance. The large amount of rock ditch, the steep slopes requiring anchor blocks, and inaccessibility taxed the skill of the contractor. Photo at the left shows pipe-laying on a slope of almost 45° above the Mariposa water reservoir near Caracas. Note the close spacing of the pedestals for anchoring pipe.

The center photo shows the hazards of the project along Quiripital Ridge, which the right-of-way follows

Jordan Test Is Being Drilled

EDWIN W. PAULEY, California independent operator, is drilling below 7,500 ft. on 1 Ramallah about 15 miles north of Jerusalem in Jordan.

The test is the second drilled on the 31,333-sq.-km. concession held by Pauley and Phillips Petroleum Co. In 1957, Phillips acquired a half interest in the concession covering about one-third of the Hashemite Kingdom of Jordan.

The test is being drilled on the middle of three highs along the top of the 75-mile Judean Highlands anticlinal trend. At last report it was drilling in marine Jurassic rock. A total depth of around 9,500 ft. is expected to tell the story.

This is the first wildcat to be drilled in the area. It is roughly 40 miles east of the nearest production, Israel's Heletz oil field. The nearest community is the mountain resort town of Ramallah.

The drill site was selected on the basis of a favorable structure indicated by surface geological studies and seismic confirmation at depth.

Parker Drilling Co. of Tulsa is the contractor on 1 Ramallah.

Last December, Pauley abandoned the first Jordan test, 1 Safra, after bottoming in basement rock at 8,471 ft. The test encountered nonmarine Cambrian rock just above the granite basement. The drill site was 40 miles east of the capital city of Amman and 70 miles east of 1 Ramallah.

Tidewater Enters Pakistan

TIDEWATER OIL CO. last week became the fourth U. S. company to enter the search for oil in West Pakistan.

The company signed an agreement with the Pakistan Government which gives it the right to explore a 10,200-sq.-mile area in Baluchistan between Karachi and Turbat.

Similar to other exploration deals made with foreign companies, Tidewater's agreement calls for a 25% participation by Pakistani capital. Profits will be split 50-50 with the Pakistan Government.

Tidewater's negotiations with Pakistan have been going on since December when David Staples, the company president, visited Karachi for a personal look at the area which his personnel had already looked over (OGJ, Dec. 23, 1957, p. 54).

Other companies engaged in Pakistan exploration are Standard Vacuum, Hunt International, Sun Oil, Pakistan Shell Oil, Pakistan Oil Fields, Ltd., and Pakistan Petroleum Co., Ltd. The last two are British companies, and the Shell company is a member of the Royal Dutch-Shell Group.

German Test Completed

A DISCOVERY in southern Germany has opened Wertemburg Province to commercial production.

The Moenchsrot 2, located 8 miles west of Memmingen, was placed on pump after perforations between 4,811-34 ft. and 4,841-52 ft. It was drilled by Wintershall - Gwerkschaft Elwerath. The nearest production is 6 miles northeast, in nearby Bavaria.

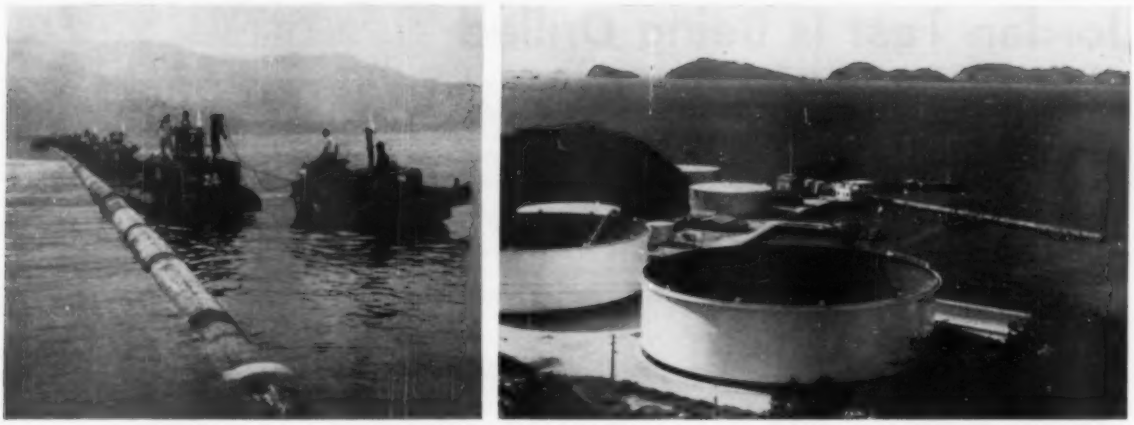
The discovery will probably further encourage exploration in the Molasse basin.

Is No Easy Job for Engineers in Venezuela

for more than 9 miles. The right-of-way sometimes is only 30 ft. wide. On one of the narrow sections a stringing truck loaded with 26-in. pipe hurtled more than 1,000 ft. down a mountain and killed two persons. Sharp elevation changes characterize the right-of-way, and in one 19-mile section the change exceeds 12,000 ft. Photo at right shows the results of another accident on the sharp curves of an access road. In this case the driver walked away.

The Anaco-Caracas section of the line will be completed late this year. Next step is an extension 63 miles westward to Valencia and Puerto Cabello. The line will have a capacity of 200,000 M.c.f. daily (OGJ, Dec. 24, 1956, p. 54). Later the line will be extended south and east from Anaco to Ciudad Bolivar and Puerto Ordaz, center of the Venezuelan steel industry on the Orinoco River. The section now under construction was estimated at the outset to cost $21,450,000.

The mountains crossed by the pipeline are the Interior Range, a northern coastal extension of the Andes.



A LARGE-DIAMETER, 30-in., submarine pipeline, linking sea berth to huge, onshore storage tanks, means . . .

Japan Now Able to Unload Super-Supertanks

JAPAN HAS BUILT the biggest tankers afloat today, but like all other maritime nations it has trouble handling the big ships once they are in service.

Few harbors in the world can handle the super-supertankers and Japan is no exception. She hasn't a harbor in the islands that will berth a tanker of more than 30,000 tons. The country is now spending almost $30 million enlarging 15 of its major harbors to take the big tankers.

One Japanese refinery with a new 35,000-bbl. plant designed to process Middle East and Far East crude couldn't wait. Idemitsu Oil Co. started building the world's longest large-diameter submarine loading line to solve the deep draft problem (OGJ, Sept. 23, 1957, p. 90).

While Idemitsu's welders were joining links of 30-in. pipe for the loading line, other welders were putting the finishing touches on the 85,500-ton Universe Admiral. The big ship was completed first at National Bulk Carrier's Kure yard, only a short distance from the refinery in southern Japan. By the time the Gulf Oil-chartered tanker finished its maiden voyage to Kuwait, the loading line was finished.

How it works . . . Four 14-ton deep-water buoys in Tokuyama Bay are linked by 12,895 ft. of the 30-in. pipe to three big storage tanks onshore at Oura.

A second 11,700-ft. section of 18-in. pipe, also on the bay bottom, links the 818,000-bbl. storage facility to the refinery at the site of the old Japanese navy's oil depot at Tokuyama.

The Universe Admiral, loaded with 610,000 bbl. of Kuwait crude, christened the new system. The vessel was moored to the four heavy buoys in a comfortable 60 ft. of water and unloaded by four 12-in. lines into the 30-in. pipeline.

The operation will be repeated many times, but the first time was a milestone in Japanese oil shipping. It was the first time that a supertanker unloaded in a Japanese port.

Shell Gets "Out of Dutch"

A 51-YEAR-OLD oil company, one of the cornerstones of the mammoth Royal Dutch-Shell Group, is stepping aside soon because it has a Dutch name where Dutch names are not popular.

The old timer, N.V. de Bataafsche Petroleum Mij., will soon become Perseroan Terbatas Shell Indonesia. The first two words of the new name mean "limited liability" in Indonesian. BPM will continue its existence in Europe only.

The new company will take over BPM operations and assets estimated at $280,000,000. They include oil fields and refineries in Java, Sumatra, and Indonesian Borneo in addition to marketing facilities throughout the islands. The firm's headquarters will be in Djakarta, the Indonesian capital. New articles of organization will be submitted to the Indonesian Ministry of Justice for his approval "soon," a Royal Dutch-Shell spokesman says.

The old BPM was incorporated at the Hague in the Netherlands in 1907 when Royal Dutch Petroleum and Shell Transport & Trading decided they would fare better together than separately. From the first until now, BPM has been one of the two principal operating companies of the group.

But, this was before the Netherlands East Indies fought off the Dutch after World War II and became the independent republic of Indonesia. Since that time the Dutch have lost popularity in the islands that were once their most valuable colonies. The latest and most concerted anti-Dutch campaign began in December when the Indonesians seized all the remaining Dutch companies and properties in the islands and ordered the rest of the Dutch nationals to leave.

The oil company, BPM, was the only "Dutch" concern to escape this nationalization drive. It was spared because its canny managers were quick to point out to the Indonesians that it may sound Dutch, but really isn't. The company lost little time letting everyone know it is 36% British owned; 20% American; 20% Dutch; 16% French; and 8% held by nationals of other nations.

Rather than face the necessity of having to remind the Indonesians of this ownership breakdown periodically, the company has apparently decided to remove the last visible vetige of the Dutch — the company's name.

Middle East Hits Peak

. . . in monthly crude production. But free world's total output is down for sixth time in 7 months.

MIDDLE EAST crude production passed the 4,000,000-bbl.-daily mark for the first time in January, due to an all-time high in Iran and the second-best month in Kuwait.

The high monthly production in the area did not keep total free-world output from slipping for the sixth time in 7 months. In the Western Hemisphere, both the United States and Venezuela had declines.

Cie. Orientale des Petroles d'Egypte accounted for more than half of Egypt's production for the first time during the month. Output from Belayim, Feiran, and Rudeis fields on Sinai Peninsula rose to 30,600 bbl. daily.

The company is 51% owned by International Egyptian Oil Co., Inc. Egyptian agencies hold the remaining 49%.

TREND OVER THE LAST YEAR

	Western Hemisphere less U.S.	Middle East	Total, Free World outside U. S.
1957			
Jan.	3,990.8	2,654.5	7,320.1
Feb.	4,040.7	2,855.8	7,561.6
Mar.	4,117.8	2,764.3	7,582.0
Apr.	4,111.5	3,140.0	7,985.0
May	4,116.0	3,556.1	8,407.3
June	4,160.6	3,957.3	8,872.5
July	4,076.2	3,989.4	8,824.7
Aug.	3,924.5	3,955.0	8,649.6
Sept.	3,759.6	3,969.5	8,504.6
Oct.	3,758.8	3,878.9	8,435.5
Nov.	3,654.7	3,704.2	8,142.9
Dec.	3,678.1	3,973.6	8,428.8
1958			
Jan.	3,680.5	4,034.0	8,460.7

World-Wide Crude Production: Daily Average in Thousands of Barrels

Country—	January 1958	December 1957	January 1957
Western Hemisphere			
Argentina	99.0	99.0	87.5
Bolivia	10.2	10.0	9.5
Brazil	41.0	41.0	25.4
Canada	482.0	431.4	545.1
Chile	13.7	13.7	10.7
Colombia	127.6	127.6	123.7
Cuba	1.4	1.0	1.2
Ecuador	9.3	9.3	8.5
Mexico	253.6	253.6	249.5
Peru	53.3	53.3	52.1
Trinidad	97.4	96.3	85.6
Venezuela	2,492.0	2,541.9	2,792.0
Total	3,680.5	3,678.1	3,990.8
Europe			
Austria	57.0	57.0	62.9
France	26.5	27.2	28.1
West Germany	78.6	85.4	71.0
Italy	20.4	23.3	18.6
Netherlands	30.0	30.0	25.8
Turkey	6.2	6.2	6.1
United Kingdom	1.7	1.7	1.6
Yugoslavia	8.5	7.6	6.9
Total	228.9	238.4	221.0
Middle East			
Bahrain	34.6	34.3	30.1
Iran*	847.0	731.0	658.0
Iraq†	618.1	628.6	226.8
Israel	1.2	1.2	1.1
Kuwait	1,315.4	1,276.1	909.4
Neutral Zone	80.0	80.0	38.4
Qatar	159.2	169.1	125.5
Saudi Arabia	978.4	1,053.3	665.2
Total	4,034.0	3,973.6	2,654.5
Other Asia			
British Borneo	119.0	119.0	118.7
Burma	9.2	9.2	4.5
India	8.5	8.5	9.2
Indonesia	296.0	320.0	276.6
Japan	6.6	6.5	6.1
New Guinea	5.5	5.8	7.1
Pakistan	5.9	5.9	5.9
Total	450.7	474.9	428.1
Africa			
Algeria	0.1	0.1	0.4
Egypt	59.8	57.0	23.7
Gabon	5.2	5.2	
Morocco	1.5	1.5	1.6
Total	66.6	63.8	25.7
Free World			
Foreign	8,460.7	8,428.8	7,320.1
United States	6,865.0	6,929.0	7,480.0
Total	15,325.7	15,357.8	14,800.1
Communist Countries in Soviet Orbit			
Romania	220.0	220.0	220.0
Russia	2,100.0	2,075.0	1,810.0
Others	60.0	60.0	50.0
Total	2,380.0	2,355.0	2,080.0
WORLD TOTAL	**17,705.7**	**17,712.8**	**16,880.1**

*Includes estimated 5,000 bbl. daily from Naft-i-Shah field not operated by consortium countries.

†Includes estimated 3,600 bbl. daily from Naft Khaneh field, operated by British Petroleum Co.

Figures are from reliable industry reports or official government sources. Data for Communist countries in the Soviet Orbit, which includes the European satellites and Red China, are based on competent estimates. Authentic information is not available on month-to-month production in these areas. Estimates also were made where complete reports are lacking.

THIS PANEL of experts shared its industry know-how with the API's transportation conference.*

Pipeliners Learn Where to Cuts Costs

COST-CONSCIOUS pipeliners last week held their annual conference under the API Division of Transportation, and the unofficial theme was how to capitalize on opportunities for economy.

Registration totaled 700, second highest in history.

The cost-cutting thread ran through the entire meeting—from the keynote to panel discussions and technical papers (see special report on next 16 pages).

C. E. Spahr, president of Standard Oil Co. (Ohio) and vice president of the API transportation division, set the pattern for the conference. Spahr reminded industry executives and engineers that the solution to current business problems is not to trim activity but rather to use the problems as opportunities for improving efficiency.

He offered positive advice that "optimism breeds on itself."

Taking their cue from Spahr, authors of papers and panel participants spelled out in detail several means to the cost-cutting end.

Stations . . . Electric and hydraulic variable-speed drives were discussed as new tools to achieve power savings by adjusting to pumping requirements and reducing wasted horsepower.

These drives, which have 15 to 18% loss at 60 to 70% of speed, are expected to have particular application on smaller lines. They will have to compete with extra pumping units as alternate way to get flexibility.

Gas turbines, which are beginning to gain acceptance of gas-transmission lines but which are scarcely more than curiosities on liquid lines, were seen as a coming prime mover.

Great Lakes Pipe Line Co.'s newly installed turbine at its West Tulsa station is the only drive of its type on an oil line in the United States. The unattended turbine stations on Trans-Arabian pipe line (see p. 125) are the only ones on an oil line outside the U.S., but station men predicted the turbine would soon become a significant power source because of increasing efficiencies, decreasing costs, higher speeds, lightweight, and adaptability to remote control.

Automation . . . Since automation and cost-cutting are first cousins, both were generally mentioned in the same breath. Here are some of the examples of the trend toward use of automatic machinery:

. . . Rapid growth of lease automatic custody transfer. Some 99 installations have been made in the U. S. and Canada.

. . . Remote control spreading to small stations with engine-driven units in the 200-300-hp. range.

. . . Controls applied to a limited extent to gathering systems, although complete automation in this area is considered impractical.

. . . Elimination of tankage on small gathering-line injection stations, particularly in sour-crude areas. This not only reduces investment but vapor losses as well.

Terminals . . . Several opportunities for economy were suggested for terminals. They included:

. . . "Key-stop" loading, where drivers would have terminal keys and do their own loading, thus cutting terminal manpower.

. . . Bottom loading of trucks to reduce vapor loss. But modification costs are high.

. . . Vapor-recovery programs to reduce loading losses.

Offshore . . . The importance of offshore production was reflected by the conference's preoccupation with offshore construction problems and costs.

Pipelines still rank a poor second as crude carriers offshore. They lag well behind barges in volume.

Construction costs, which offer part of the explanation, are substantially above the onshore rule-of-thumb of $2,500-per-inch diameter per mile.

Pipeline costs offshore were estimated to range from $4.50 per foot for 8-in. pipe in water up to 50 ft. deep to $8.50-$9 for 20-in. Burying costs range from $2.50 per foot in shallow water to $3.50 in 100-ft. water, particularly if the bottom is unstable.

Taking note of predictions for drilling in 600-ft. water, panelists considered the feasibility of laying pipe at such depths. Construction experts say it can be done—for a price. It's estimated that pipe laying in 600-ft. water will cost 1½ to 2 times as much as in 60-ft. water.

At that point it will be question of whether pipelines can compete with marine transportation. Only a high-volume line would stand a chance. Dual-phase production thus far has dictated construction of some lines to handle the gas. But where crude alone is involved, barges have generally been the choice.

*Panelists (left to right): F. V. Cook, Service Pipe Line Co.; W. O. Seabury, Ohio Oil Co.; James C. Phelps, Continental Pipe Line Co.; C. C. Keane (standing), Great Lakes Pipe Line Co., presiding; H. G. Mariner, Service Pipe Line Co., moderator; D. A. Roach, Phillips Pipe Line Co.; Harry Nelson, Cities Service Pipe Line Co.; and Fred S. Jones, Platte Pipe Line Co.

Unattended turbine stations on Tapline change Middle East pipeline economics. Investment is only one-sixth that of community-type stations built originally

SIX NEW pumping units have just been placed in operation by Trans-Arabian Pipe Line Co. The units are driven by 5,000-hp. General Electric combustion gas turbines. These units, together with the original pumping equipment driven by diesel engines, provide the power to move 450,000 bbl. per day of crude oil a distance of 754 miles through a 30-31-in. pipeline from Qaisumah, Saudi Arabia, to a tanker-loading terminal on the Mediterranean Coast near Sidon, Lebanon.

The gas-turbine pumping units are of two types:

- Portable prefabricated units for unattended operation at intermediate sites.
- Permanently installed units at existing stations.

Both types have unusual features. However, the portable units, known as auxiliary pumping units, are unique in design and include a number of innovations in the application of gas turbines to the pipeline industry.

The original Tapline system, as completed in December 1950, had four diesel-engine-driven pumping stations, spaced about 160 miles apart, which provided an initial capacity of 320,000 bbl. per day. Each of these main stations is a complete community in the vast and barren Arabian Desert. The desert climate is characterized by extremely low rainfall and ranging from 120° F. in summer to 30° F. in winter.

Fig. 1 gives an impression of the extent of the facilities at a typical diesel pump station. The installation includes housing for 80 to 250 employes, a community center with a dining hall, commissary, and recreational facilities, warehouses, garage, shops, and hospital, as well as the main pumphouse and oil-handling facilities. Each station has its own water supply and complete utility sys-

Paper presented at annual pipeline conference, API Division of Transportation, New Orleans, March 31-April 2, 1958, under original title, "Design and Operation of Gas-Turbine Pumping Units of Trans-Arabian Pipe Line Co."

The authors say . . .

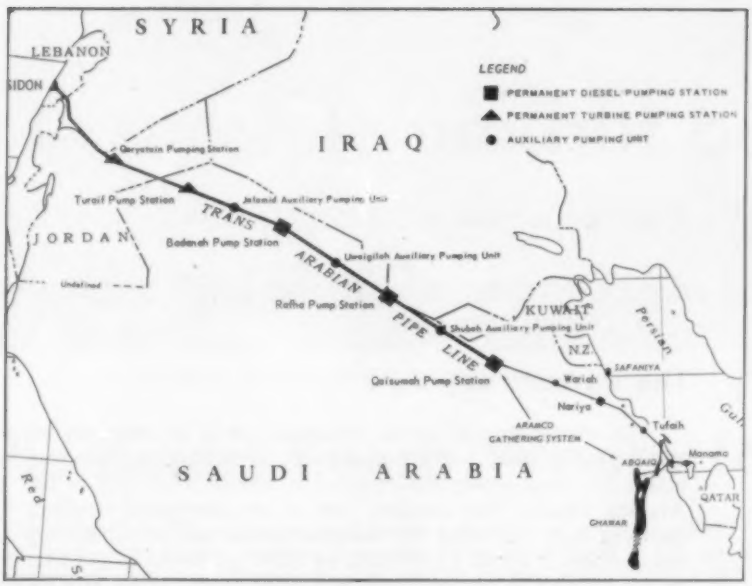
The unattended gas turbine pumping unit is an extremely attractive installation, from the standpoint of investment per horsepower, for large power requirements in remote areas such as the Arabian Desert. The installed cost of an unattended auxiliary pumping unit, including the communication and portable shop installations, is about $1,500,000, or $250 per brake horsepower on the basis of an expected annual average output of 6,000 b.hp. This is one-sixth the investment per horsepower of a conventional community-type pumping station in Saudi Arabia.

Preliminary operating experience indicates that the auxiliary pumping units will have a high degree of reliability and a relatively low operating cost despite a fuel consumption per horsepower-hour approximately twice that of the originally installed diesel engines.

The feasibility of unattended gas-turbine pumping units definitely changes the economics of pump station spacing for large-diameter pipelines in the Middle East. Because of the lower investment per horsepower, the optimum spacing for unattended pumping units will be much closer for a given pipe size than for the older, extremely expensive stations of the community type.

BY W. E. LOCHER, A. E. OLSON AND P. P. NIBLEY
Trans-Arabian Pipe Line Co.

THE AUTHORS and three other Tapline personnel inspect an auxiliary pumping unit newly installed on Trans-Arabian pipeline. They are A. E. Olson, G. F. Heide, J. J. Kelberer, W. E. Locher, P. P. Nibley, and J. F. Terry.



TRANS-ARABIAN pipeline and Aramco system extends from Persian Gulf to Mediterranean.

tem. Water is available only from wells, some over 1,000 ft. deep.

The present Tapline system consists of the original system supplemented by:

- Three portable auxiliary pumping units in Saudi Arabia.
- A permanently mounted turbine unit at an existing maintenance base in Jordan.
- Two permanently mounted turbine units which replace the original diesel-driven pumping units at the Turaif pump station and which increase the horsepower of this station.
- The diesel units of the original Turaif plant, which are being relocated at the other diesel stations of the original system.

In addition, Arabian American Oil Co. (Aramco) has installed two similar auxiliary pumping units on its 270-mile line feeding its crude-oil production into the Tapline system at Qaisumah (see map). One identical unit is available as a standby for the five portable operating units.

Total investment by both companies for these new facilities is about $21,000,000. This figure includes additional tanks, shops, communications and control systems, and other supporting facilities.

Factors in Pump Design

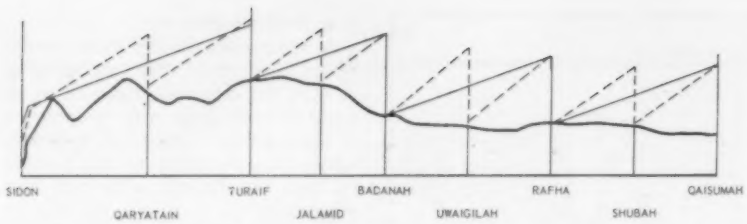
Tapline was initially constructed to accommodate four additional pump stations at intermediate locations. However, the large investment and relatively high operating costs of complete community stations made this type economically unattractive for the intermediate sites. The question of what kind of intermediate unit to install was kept under continuous study as the development of new equipment made various alternatives available for consideration.

The most attractive scheme to increase capacity involved installing one 5,000-hp. unattended pumping unit at each intermediate location. This installation would consist of only the minimum facilities for pumping oil.

The simple-cycle combustion gas turbine was the only prime mover which satisfied the unique design requirements to make these auxiliary pumping units attractive. These requirements were:

- 5,000-hp.-output for continuous operation at 110° F. ambient temperatures and 2,600-ft. elevation.
- Prime mover to be fueled with crude oil taken directly from the pipeline.
- Unit to be suitable for unattended operation with supervisory control from base stations 50 to 100 miles.
- Unit to be portable to permit

SPRAWLING DIESEL pump station is shown in this aerial view. Fig. 1.



PROFILE and hydraulic gradient for Qaisumah-Sidon trunkline. **Fig. 2.**

rotation and major overhauls at a central shop.

International General Electric Co. was the successful bidder for supplying both the auxiliary pumping units and the permanently mounted turbines for the main stations. The auxiliary pumping units were completely prefabricated and factory-tested in the United States. They were then shipped to Saudi Arabia, hauled overland to the job site, slid onto concrete foundations, and connected to pump oil. Virtually all the work of installation was completed by March 1, 1958.

The design and manufacture of these pumping units involved considerable pioneering. This is the first time that a main-line oil pump has been driven directly at gas-turbine speeds; the speed range of 5,000-6,000 r.p.m. is considerably higher than that commonly used for oil pumps. This is the first time that a complete 5,000-hp. pumping unit has been prefabricated and made wholly portable. Also, this is the first time that a gas-turbine pumping unit has been operated unattended and by remote control.

Hydraulics and Pressure Surges

A simplified profile and hydraulic gradient is shown in Fig. 2. The solid line shows the hydraulic gradient without the auxiliary gas-turbine units. Under this condition the line operates as an open system with a tank connected to the incoming line at each station.

The tanks isolate the sections of the line between main stations, in a hydraulic sense, so that in effect there are four pipelines, each terminating in a tank. The intermediate gas-turbine-driven pumps are therefore easily brought on stream, since each one affects only the pressures in one section.

The Turaif-Qaryatain-Sidon section is slightly more complicated because the incoming pressure at Sidon is controlled to keep the pipeline packed as its elevation drops sharply from the control point to Sidon. When the gas-turbine unit at Qaryatain is started, Sidon must lower its incoming pressure to avoid overpressuring pipeline between Qaryatain and Sidon.

The addition of gas-turbine pumping units has created a pressure-surge problem that did not exist previously on Tapline. In the original system, a 96,000-bbl. floating-roof tank connected to the suction of each of the pump stations provided protection against dangerous surges whenever a station shut down.

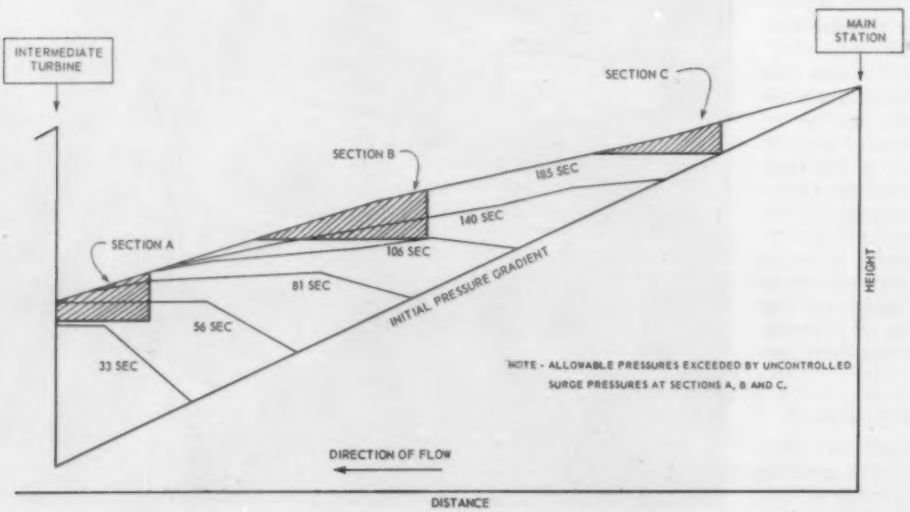
The gas-turbine pumping units were added without any provision for tankage at the intermediate locations. It was recognized that, when one of these units trips off, a high-pressure surge would travel upstream toward the main station and in certain critical regions would exceed the allowable pipeline pressures. To minimize the effect of surges, Tapline installed surge-protection equipment to permit both the pump stations and the auxiliary pumping units to operate at maximum discharge pressures.

A study of the theory of transient pressures and preliminary tests led to a prediction of pressure-distribution curves of the type illustrated in Fig 3, which also shows critical sections where allowable pressure is limited by a change in wall thickness on the pipeline.

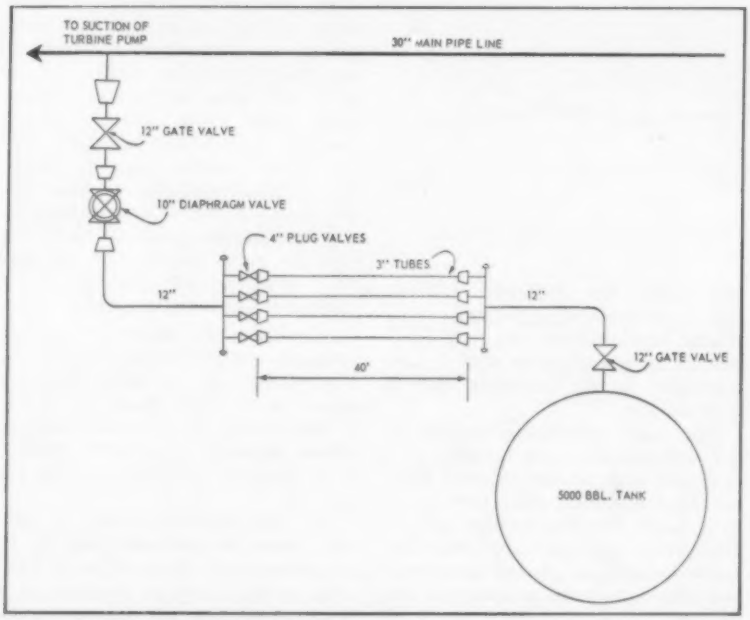
The lines marked 33 sec., 56 sec., etc., show the probable progress of an uncontrolled pressure surge traveling in the upstream direction as a result of tripping off the gas-turbine unit. It is seen that all three of the critical sections A, B, and C, would be overpressured by the surge.

Critical sections illustrated by B and C of Fig. 3 occur downstream of all four main pumping stations on Tapline. These can be protected by quickly reducing the main station pressure. Under normal conditions, a signal is transmitted over the VHF communications system as long as the gas-turbine unit is running. If the gas-turbine unit trips, the signal ceases and the main station pressure is reduced automatically by deenergizing a circuit at that station which reduces its discharge pressure.

A relief valve is installed at Qaryatain to protect a section illustrated



PREDICTED PRESSURE distribution for uncontrolled surges when turbine unit trips off. **Fig. 3.**



SURGE PRESSURE relief system at Qaryatain station. Fig. 4.

by A in Fig. 3. The valve is a 10-in. diaphragm-operated type and opens to relieve through a fixed group of four 3-in. friction tubes and thence into a 5,000-bbl. tank as shown in Fig. 4. The valve controls are arranged to operate in the following manner:

1. Air pressure from a supply tank is applied directly to the valve diaphragm when the gas-turbine unit trips off. This pressure opens the valve rapidly.

2. After the valve is opened, air is bled off the diaphragm at a controlled rate to close the valve in about 6 to 7 minutes. This allows time for the automatic reduction of discharge pressure at Turaif and the establishment of steady pressure conditions in the pipeline.

This surge-protection system has been tested in the Turaif-Qaryatain section. The relief valve and the reduction of Turaif discharge pressure functioned automatically in the manner described above. After the Qaryatain gas-turbine unit tripped off, the maximum surge pressures remained safely below the maximum allowable pressures throughout this section of the pipeline. This test confirmed that the design basis for the surge-protective equipment was substantially correct.

Auxiliary Pumping Units

Fig. 5 shows an aerial view of a typical unattended auxiliary pumping unit. The installation consists of four portable vans:

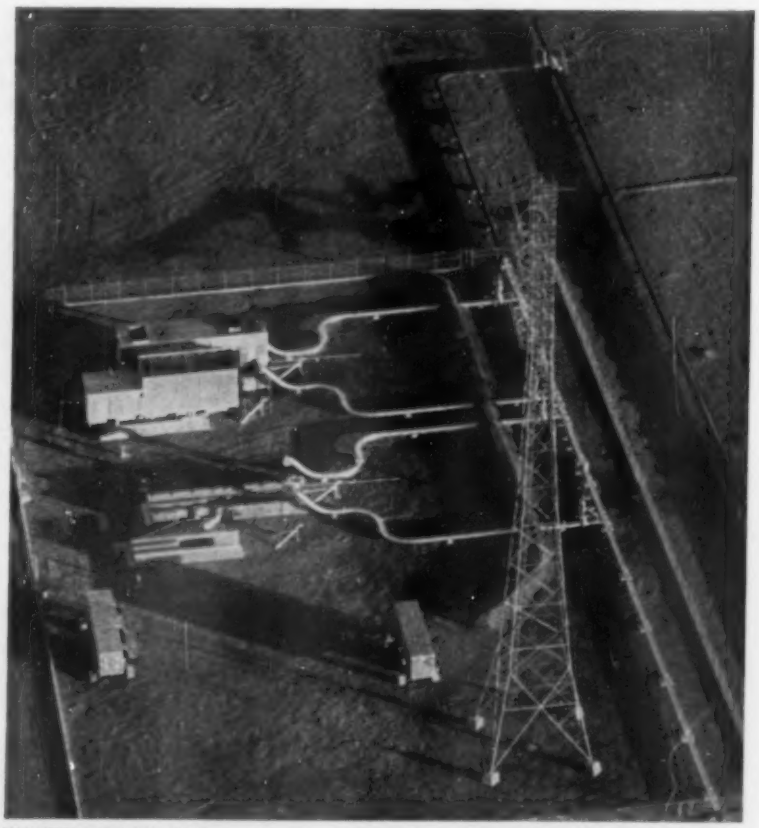
- Turbine-pump van.
- Control and filter van.
- Radio van (with 200-ft.-high antenna tower permanently erected close by).
- Portable shop van.

A comparison of the extensive facilities at a typical diesel station (Fig. 1) with the minimum facilities at an auxiliary pumping unit presents a vivid contrast. Yet the hydraulic horsepower delivered to the pipeline by both installations is of the same magnitude.

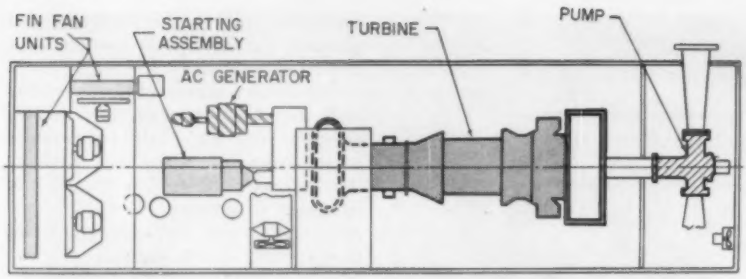
Turbine-pump van . . . Fig. 6 shows a simplified plan view of the turbine-pump van. It is approximately 53 ft. long, 15 ft. wide, and 18 ft. high. The van is divided into two rooms, one containing the gas turbine and the other containing the pump. The rooms are separated by a fire wall, pressurized on the turbine side.

The gas turbine is a two-shaft simple-cycle unit, rated at 5,000-hp. shaft output at 110° F. and 2,600-ft. altitude. The gas turbine burns crude oil taken from the pipeline. The crude oil contains about 10 p.p.m. of vanadium and requires addition of 0.03% by weight of hydrous magnesium sulfate to minimize corrosion of the turbine blades. The additive system for blending an aqueous solution of the additive with the crude is contained within the turbine and control vans.

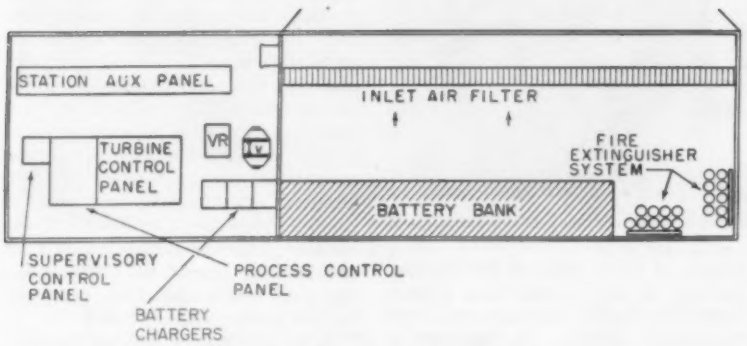
The turbine is started by a 200-hp.



UNATTENDED TURBINE auxiliary pumping unit shown here contrasts with diesel station. Fig. 5.



TURBINE-PUMP VAN is shown in simplified plan view. Fig. 6.



CONTROL and filter van layout. Fig. 7.

diesel engine with torque-converter drive. The engine is coupled to the gas turbine through a jaw-type clutch which automatically disengages when the turbine reaches self-sustaining speed.

The main crude-oil pump is driven directly at gas-turbine speed (5,000-6,000 r.p.m.). The pump was manufactured by Byron Jackson Pumps, Inc., and is an extremely compact unit, with an over-all length of 5 ft. 1 in., maximum width of 4 ft., maximum height of 4 ft., and weight of 4,650 lb. The pump has the unique features of weighing less than 0.8 lb. per brake horsepower and delivering more than 600 psi. differential with a single-stage impeller.

The turbine, in addition to driving the main crude pump from the load turbine shaft, also drives a 125-kva. generator from the compressor shaft. This generator supplies electric power for the entire auxiliary pumping unit when the gas turbine is operating.

The temperature of the cooling water for the gas-turbine lube-oil system and for critical parts of the turbine is automatically maintained by circulating the water through two fin-fan units. Air is circulated through these units by two fans driven by 20-hp. motors. During cool-down of the unit, an auxiliary 5-hp. d.c. fin-fan cooler is used.

The over-all weight of this van including all equipment is approximately 125 tons.

Control and filter van . . . Fig. 7 shows a simplified plan view of the control and filter van. The van is similar in construction and has about the same dimensions as the turbine-pump enclosure. The section of the van containing the inlet-air filter is open on top to admit air to pass through the filter for the gas turbine and for ventilation of the turbine and control rooms.

The inlet-air filter is of the traveling-screen type with an oil-bath reservoir at its base. The battery bank and the fire-extinguisher system are located on one sidewall of this enclosure. Fig. 8 shows this equipment mounted in place.

The control-room portion of the van contains the basic control panels for the auxiliary pumping unit. Like the turbine room, it is operated at a slight positive pressure to exclude dust and petroleum vapors.

The auxiliary panel which contains the electrical switchgear, motor starters, and control relays is mounted in this room. This room also contains the turbine control panel, process control panel, and remote supervisory control panel, as well as the voltage regulator, battery chargers, and a 10-kva. inverter. The 10-kva. inverter is used to supply constant-frequency a.c. power to some of the instruments, and to supply the basic power for the communication system.

The over-all weight of this van including all equipment is about 84 tons.

Radio van . . . The radio van contains the VHF radio transmitters and receivers and a 30-kw. auxiliary diesel-generator set. There are three 250-watt, 150-megacycle, FM transmitters in each van; two transmitters are for voice, telemetering, and supervisory equipment, and the third is for communication with mobile equipment. The system employs scatter propagation and utilizes extremely high gain antenna arrays mounted on 200-ft.-high towers.

When the gas turbine shuts down, the auxiliary generator starts automatically and supplies power to the 208-volt bus to maintain lights, communication, essential services, and a charge on the 800-amp.-hr. battery bank. If the auxiliary diesel generator set is temporarily out of service, the station battery, fully charged, is capable of supplying electric power for three complete startups and shutdowns of the gas turbine. The battery also supplies power to maintain communications for a preselected period up to 1 hour. Information transmitted during this period is the basis for making decisions on whether to restart the unit by remote control or whether to dispatch maintenance personnel.

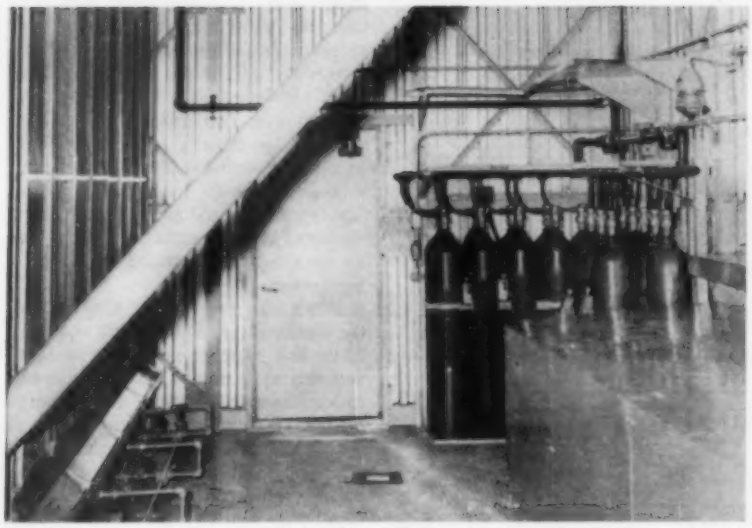
Portable shop van . . . The portable shop van is divided into two sections. One is a shop and parts-storage area equipped with power tools. The other is a personnel locker-room area, equipped with an electric kitchen and a wash room for use by maintenance personnel.

Control System

Fig. 9 shows the schematic routing of a control signal initiated from the master supervisory control panel. This panel is located 50 to 100 miles from the operating unit at one of the permanent pump stations. The supervisory control system is an all-relay, space code selector system. This system provides the means for starting and stopping the turbine by remote control, for changing discharge pressure, and for receiving alarms covering important functions.

In addition to the supervisory control, there are four process functions which are telemetered continuously, namely, ambient temperature, discharge pressure, and suction pressure at the auxiliary unit, and discharge pressure set point. The supervisory and telemetering information is carried simultaneously on two independent VHF circuits.

The use of two circuits is provided to avoid an interruption of contact between the master station and the operating station in case one of the circuits fails. It also allows the use of diversity reception, which greatly im-



FILTER ROOM view shows fire extinguisher system, battery bank enclosure. Fig. 8.

proves the reliability of the communication system.

Control panels . . . Fig. 10 shows the front view of the master supervisory panel. The top instrument is the ambient-temperature indicator. Located directly below is a chart recorder for the process functions. The lower section of the panel contains the supervisory control functions.

The basic controls for the auxiliary pumping unit are the start-and-stop selector keys, the raise-and-lower set-point selector keys, and the selector keys connected to the voice-communication channel which initiate contact so that a microphone in either the pump room or the turbine room of the operating unit can be heard at the master station.

Alarm system . . . For transmission to the master station, the various indications of malfunction at the auxiliary unit are segregated into three groups, called first-order, second-order, and third-order alarms. The operator at the master station receives an indication of the group to which the malfunction belongs but is not informed as to the precise nature of the malfunction.

First-order alarms and trips include serious faults such as overspeed, low lube-oil pressure, excessive vibration, and fire. The unit trips off for any malfunction in this group. A maintenance man is dispatched to the unit and no effort is made to restart it remotely until the fault has been located and corrected.

Second-order alarms and trips involve less-serious malfunctions such as failure of starting clutch to engage, loss of flame, and low battery voltage. When the master station receives this indication, a maintenance man is dispatched to the unit, but meanwhile the operator will attempt to start the unit if it has tripped off.

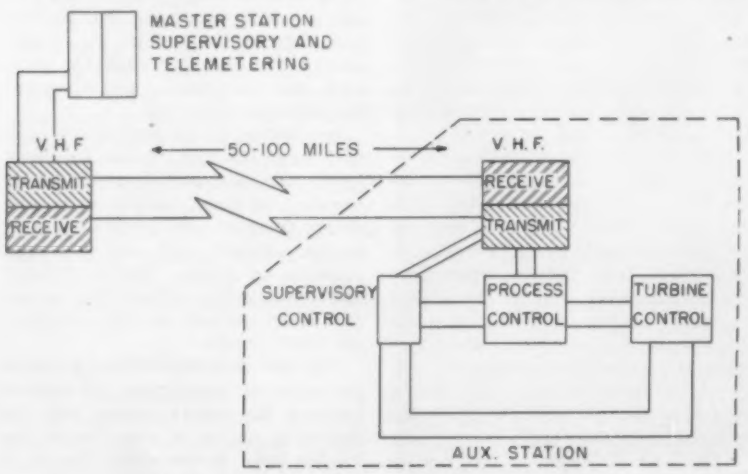
Third-order alarms and trips involve high discharge pressure, low suction pressure, and high case temperature on the main-line pump. On receiving this indication the unit is restarted or continues to operate. A maintenance man checks the malfunction on his next routine visit to the unit.

Remote control . . . One of the interesting features is the startup and operation of the unit by remote control. The operator at the master supervisory control first checks to make sure that the panel is clear of alarms and in remote-start position. He then depresses the "start" selector key.

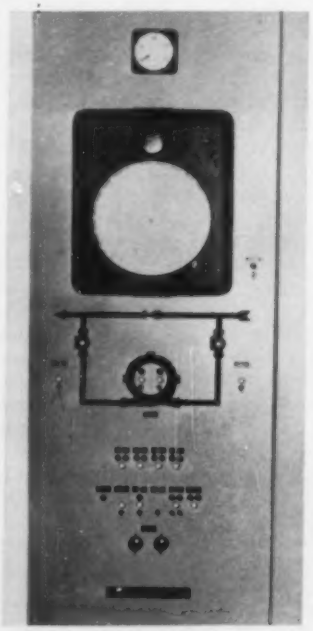
This action sends a signal to the turbine-control panel which in turn sends a signal to the motor-starter panel to start the d.c. motors of the auxiliary fans and pumps required for commencing operations. The main-line gate valves also open, pressurizing the main crude-oil pump.

After a 5-minute interval required for purging the turbine van with the d.c. purge fan, the starting diesel is automatically started, the clutch is engaged, and the turbine is accelerated to firing speed. After the turbine is fired, it is further accelerated to idling speed. During the acceleration, the breaker for the a.c. shaft-driven generator is closed; the a.c. station motors are started in preset sequence, and the d.c. motors are shut down.

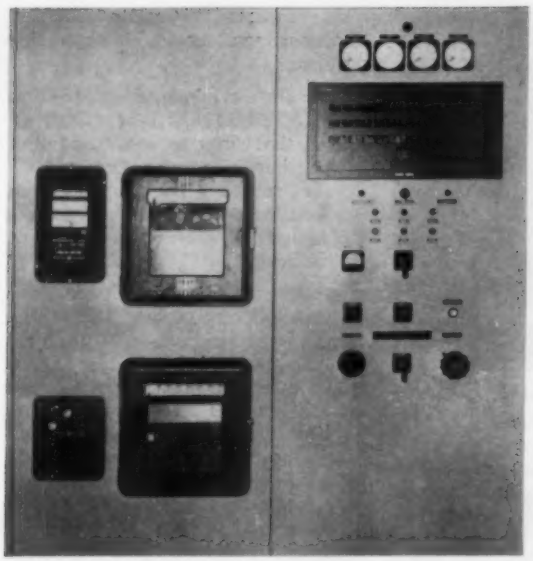
After that, a signal is sent back to



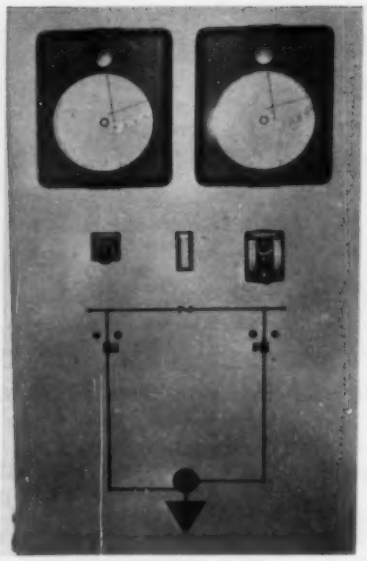
CONTROL SIGNAL follows this route. Fig. 9.



MASTER supervisory panel. Fig. 10.



TURBINE CONTROL panel. Fig. 11.



PROCESS control panel. Fig. 12.

the master control panel, indicating that the starting sequence has been completed. The entire sequence of operation is automatic once the operator depresses the start key.

The unit is then ready for adjustment of discharge pressure set point. This set point is controlled by the operator, who depresses the raise or lower set-point selector keys as required. Once a set point has been established, the process control automatically maintains the required pump speed to maintain this discharge pressure until a new setting is called for.

Fig. 11 shows a front view of the turbine control panel. This panel is of duplex construction. The left-hand side contains a vibration recorder and two temperature recorders. The right-hand section contains the turbine control equipment; at the top are speed indicators of the high-pressure and low-pressure turbine shaft, second-stage nozzle position indicator, and fired hours timer.

Directly below these indicators is a 36-point annunciator panel. Below these are lighting groups indicating the operation of various units, as well as required selector switches for starting, stopping, and operating the turbine locally.

Fig. 12 shows a front view of the process control panel. The process system basically compares a pneumatic pressure established by a transmitter (which converts a process pressure to a pneumatic pressure signal) with an established pneumatic pressure which is a function of the desired process pressure (set point). If there is a difference in these readings, an "error" signal is sent to the turbine control to increase or decrease turbine speed accordingly.

In addition to the basic controls, there are overriding features which limit the rate of change of pressure and which limit the minimum suction and maximum discharge pressure to prevent damage to the pump or pipeline.

The equipment shown in Fig. 12 consists of two recorders, to keep records locally of various process functions, as well as necessary instruments and controls for operating the process set point locally. Since the basic pressure-control system is pneumatic, this signal is converted to an electrical signal for transmission of telemetered information to the master station.

Permanent Pumping Units

Fig. 13 shows the pumphouse containing a permanently installed gas-turbine pumping unit at the maintenance base at Qaryatain, Jordan. The turbine unit and control system are almost identical to those in the auxiliary pumping units. The pumphouse is operated on an unattended basis. The pumping unit is controlled from the nearest main station more than 100 miles away.

The installation of two 5,000-hp. turbine pumping units at the permanent pump station at Turaif, Saudi Arabia, follows a more conventional pattern with the exception of a unique suction booster pump. When both turbines are in operation, an excess of hydraulic horsepower is utilized to operate a hydraulic turbine-driven booster pump, to provide a suction pressure of 60-90 psig. for the main pumps. This is accomplished by bleeding part of the main oil stream from the station discharge back to the station suction through a hydraulic turbine. Use of this power source avoided installation of supplementary generator capacity. The hydraulic-driven pump was supplied as a package unit by Byron Jackson Pumps, Inc.

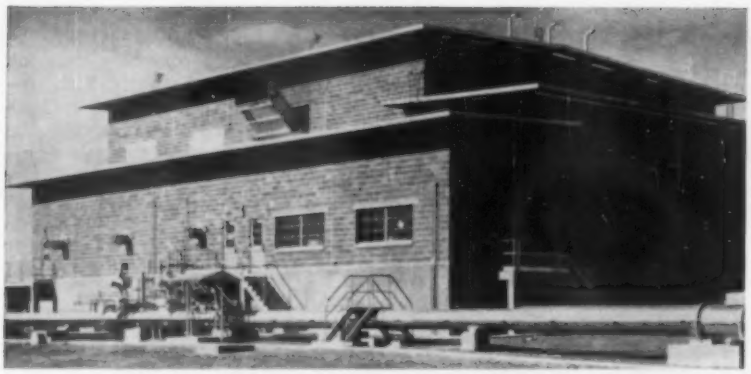
Operation and Maintenance Experience

Up to March 1, 1958, Aramco and Tapline had successfully operated the gas-turbine pumping units for a total of approximately 12,000 hours. Most of these operations were carried out with personnel in attendance, many of whom were present only for possible emergencies or to record pertinent data from nonrecording instruments. However, one of the auxiliary pumping units has had several months of unattended operation, with an availability factor of better than 90%. Another was successfully operated unattended after a trial run of only 80 hours. Fig. 14 shows the turbine and control vans as installed for operation.

Initial design premises were based on estimates that, with the installation of an additional 180,000-bbl. tank at each main station, an operating factor of 80% would be realistic for the increment of capacity added by the auxiliary units operating in series with the main pump stations. Experience to date with the auxiliary units has pointed the way to significant improvements in operating factor, and intensive efforts are being made to bring this as close to 100% as possible.

Experience also shows that the control and communications equipment requires accurate final adjustments and careful maintenance by specialized personnel, but no major control modifications have been required.

Turbine overhaul . . . Two of the auxiliary pumping-unit turbines have been disassembled at their regular locations in order to make adjustments to main bearings and seals. To do so, a crane was moved to the turbine van and, after the removal of sections of the roof, parts of the turbine were removed and laid on a canvas on the



GAS TURBINE pumphouse at Qaryatain, Jordan. Fig. 13.

ground outside and protected by a canvas covering.

Although dust storms occurred at frequent intervals, it was possible to do all the necessary work and make final adjustments during periods of clear weather. Such work can only be accomplished by a crew of men who are trained to work under adverse conditions.

Those parts which required machine-shop work were moved either by vehicles or by aircraft to and from the central machine shop at Turaif. This shop is equipped with a dynamic balancer, a test stand specifically designed for the turbine control and auxiliary equipment, and the necessary machine-shop equipment to handle all parts.

Tapline plans to move each turbine van to the central shop at Turaif for major overhauls. During these occasions the spare turbine van will be installed for temporary operation at the intermediate location.

Minor maintenance . . . All of the equipment in the auxiliary pumping units is new to virtually all of Tapline's maintenance personnel. Accordingly, problems of adjustment, calibration, and trouble shooting have taken longer to resolve in the beginning stages than they will in the future. Some of the troubles which have been encountered are:

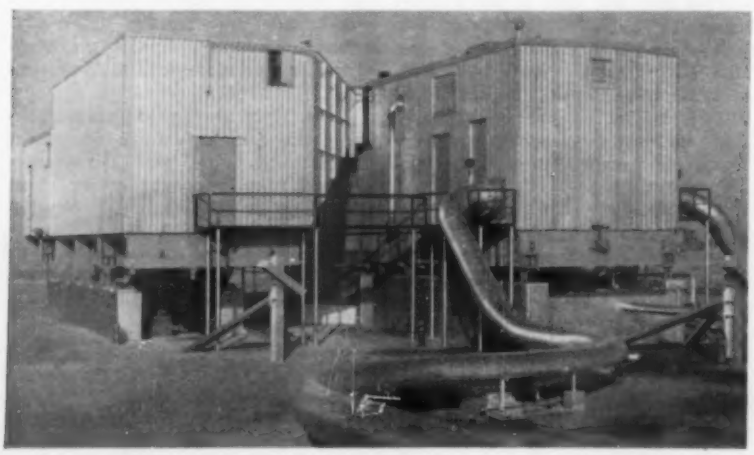
- Fuel-pump failure caused by sticking of the plungers. The longest continuous operation of a Sundstrand fuel pump to date is 1,700 hours. This is a pump of special design having very close tolerances. In an effort to eliminate plunger sticking, experiments are under way to test the lubrication of these pumps at various locations with lube oil, with diesel fuel, and with the crude oil used for combustion. Results to date seem to indicate that crude-oil lubrication will afford the best answer.
- Scoring of mechanical seals on main-line pumps. Several sets of seals were scored by foreign material at the beginning of operations. A considerable quantity of this foreign material, which had been lying dormant in the pipeline, was picked up when the flow rates increased. Properly designed knockout pots should eliminate this problem.
- Failure of combustion-cone clips. Some of these clips have failed, allowing the cones to move and thus causing improper combustion and excessive smoke. The supplier has changed the design of and fabricating techniques for these clips to correct the difficulty.
- Recirculation of exhaust gases and lube-oil vent vapors. These gases and vapors have been sucked into the compressor intake and have fouled the compressor blades with an oily carbon deposit. To minimize this problem in the future, the exhaust stacks have been extended, and the lube oil vents have been piped alongside the stack extension.

No special troubles have been encountered with the electrical system. Adjustment of contacts, setting of relays, and proper voltage adjustment for controls and motors have all been performed with dispatch. Additional voltage-regulating equipment was required for critical communications components.

Operating performance . . . The Byron Jackson high-speed main-line pump is now operating with a suction pressure as low as 60 psig. It has been determined that slight cavitation begins at 28 psig. at 18,000-bbl. per hour flow rate—a much lower pressure than had been anticipated.

During a load test at Qaryatain the turbine load shaft output reached approximately 7,500 b.hp. Under the conditions of ambient temperature and taking other factors into consideration, the turbine performance met expectations. With the ambient air temperatures encountered along the pipeline, turbine power is expected to range from 5,000 to 8,000 b.hp. and to average about 6,000 b.hp. over the course of a year.

After the first 12,000 hours of operation, Tapline is convinced that basically it has a well-designed auxiliary pumping unit, which can be successfully operated by remote control. Equally important, Tapline has been able, by means of careful and selective recruiting, to attract the required personnel who can properly maintain this unit.



CONTROL AND TURBINE vans installed for operation. Fig. 14.

Literature

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Proposed new pipeline policy could bring about

Greater rewards from LACT

THE USE of lease automatic custody transfer (LACT) equipment is growing rapidly after a rather long period of development. Many of the installations have paid off handsomely to the producers through saving the price of new tankage which would otherwise have been required. Still, the surface has only been touched, and we may expect that producers can profitably expand LACT far beyond its present use.

Producers are currently making these installations only at those locations where it is to their benefit: on leases with fairly high production where new tankage is required. So far, these scattered applications have permitted very little net savings to the pipeline companies. Further development on this basis alone will restrict the areas of profitable application of LACT equipment to the producers and will continue to give little benefit to pipeline companies.

Economic studies indicate that LACT equipment has almost unlimited potential application that can net good returns to the industry. This can be accomplished, however, only if leadership and initiative are assumed by pipeline companies as well as producing companies.

This article . . .

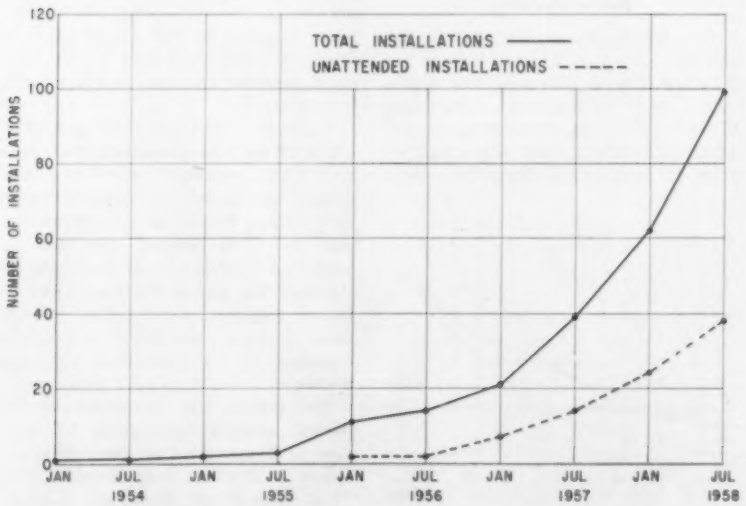
Here are reviewed the present status of LACT usage, likely directions for technique advancement, and the need for pipeline leadership. A proposed pipeline policy intended to encourage early realization of the potential benefits to the industry is also outlined.

In addition to providing new information, an effort has been made to bring up to date some of the data contained in the paper, "Automatic Custody Transfer of Crude Oil," by Packard, Kelly, and Newberg, which was presented at the annual API meeting in Chicago in November 1956. Mechanical design of LACT units is not discussed comprehensively since this subject is covered in the many good articles listed in the bibliography.

Although no effort will be made to provide a history of the development of LACT, some industry firsts are mentioned. Experimental work was begun on an LACT system utilizing tanks by Shell Oil in Antelope field of North Texas early in 1948.

Imperial Oil, Ltd., placed the first unattended system in operation during November 1955 in Redwater field in Canada. This installation uses positive-displacement meters for volume measurement. In the United States, the first unattended LACT installation was a tank system placed in operation by Gulf Oil Corp. in Bloomer, Kans., during December 1955.

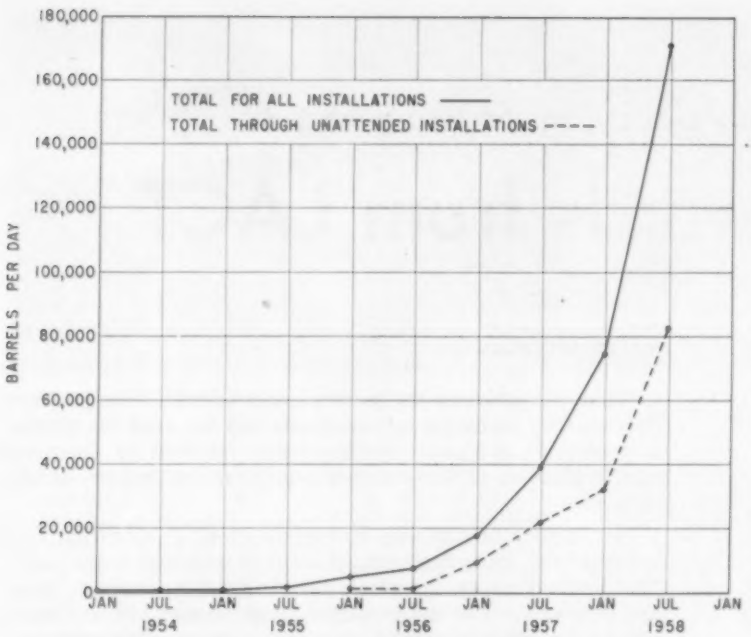
BY H. L. SHATTO AND A. H. HALL
Shell Oil Co. and Shell Pipe Line Corp.



RAPID LACT GROWTH is shown in the past year. Fig. 1.

Present Application

The quick growth in the use of automatic-custody-transfer equipment can probably be attributed to two principal factors: (1) the economic advantage it offers, and (2) the atmosphere of cooperation provided by API through a special study group on lease automatic custody transfer, which the committee on crude-oil measurement established almost 6 years ago. It was recognized early that because of the numerous groups interested in the transfer of custody of oil from leases, much work would be required to resolve the many directions this development was taking. The information bulletin on Lease Automatic Custody Transfer (Bulletin 2509-A), which was published by the API in August 1955, has provided a framework or basis for the mutual



THROUGHPUT for 99 systems has reached 170,000 bbl. daily. Fig. 2.

agreement which must be reached among affected parties before an installation can be placed in operation.

Survey scope . . . Early this year the API committee on LACT prepared a questionnaire in an effort to learn the number and types of systems which are in operation or under construction. Many of the results of this survey are included here since they are of timely and general interest.

But credit for this information lies not with the authors but with the API and its committee on LACT and with those who provided replies to the questionnaire so freely and promptly. Some first-hand information was obtained by the authors, in the company of other industry representatives, through an on-the-ground inspection of many of these ACT installations during February.

The survey made by questionnaire is believed to cover nearly all of the LACT facilities now in operation, under test, or under construction. The data given cover a total of 99 installations, all of which should be in operation by July 1958, and involve 18 producing companies, 29 pipeline companies, and locations in 12 states and 2 provinces of Canada.

Very few fields have a sufficient concentration of installations to provide an opportunity to study the effect these systems have on pipeline-company operations. Those fields which will have such a concentration, notably those in the Four Corners area, are not yet in fully unattended operation and no conclusions can be drawn at this time.

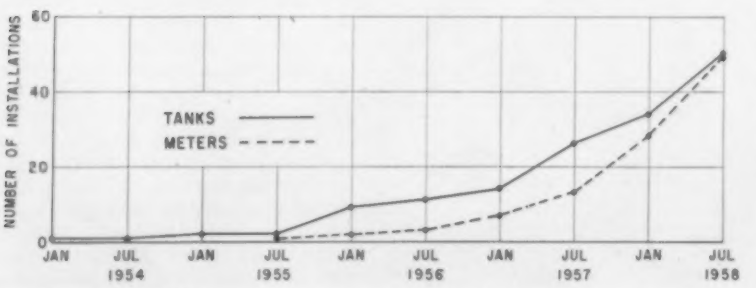
Survey Results

The rapid rate of increase in the number of LACT installations is shown in Fig. 1. The solid line represents total installations, including those which are experimental and which are under test for approval prior to unattended operation. Note that the total number of installations has doubled and almost tripled each year since 1954.

Approximately 40% of the total installations shown are in unattended operation. The difference between the total number of installations and those in unattended operation is due principally to the lag between construction of an installation and the beginning of unattended operations.

Fig. 2 shows the rapid increase in the amount of crude oil being measured by LACT facilities. The total throughput for the 99 systems covered in this survey amounts to 170,000 bbl. per day, and about half of this total is—or will be by the middle of 1958—handled by unattended facilities.

The production to be measured by LACT installations completed by July 1958 amounts to less than 2.5% of the production in the United States and Canada, and less than 1.2% of this production will be in unattended operation by midyear. These percentages are not significant in themselves, but if the past rate of growth continues, and there is every reason to believe that it will, a significant share of total production should be in



METER SYSTEMS are catching up with tank-measuring units. Fig. 3.

THE AUTHORS

H. L. SHATTO

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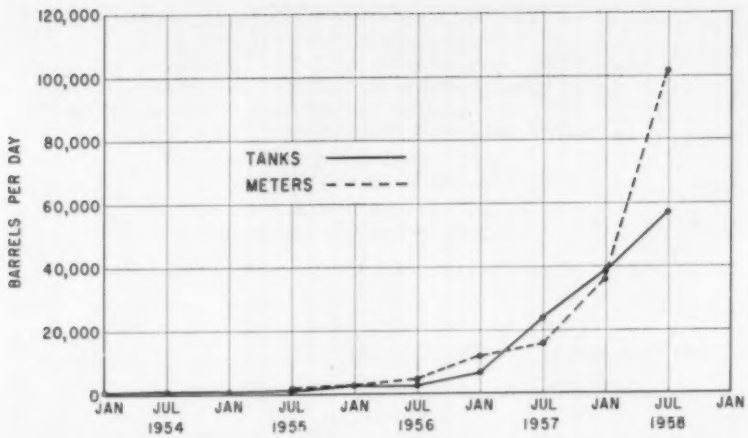
The paper was presented at the annual pipeline conference, API Division of Transportation, New Orleans, March 31-April 2, under original title, "The Growth of Automatic Custody Transfer."



VOLUME IN METER units soon will double crude measured by tank systems. Fig. 4.

unattended LACT operation within a few years.

Fig. 3 shows the comparative growth of meter systems and tank systems. For over 2 years tank systems have held a substantial lead; however, by midyear 1958 there should be about as many meter systems in operation as there are tank systems. The total throughput for meter systems will have jumped sharply upward to almost twice the throughput for tank systems by midyear as shown in Fig. 4.

Size, volume, and storage . . . The throughput capacities of LACT installations, which range from 5 to 30,000 bbl. per day, are shown in Fig. 5. The largest grouping of installations appears to be in the 500 to 1,000-bbl. per day range, which indicates that LACT equipment can be most easily justified in leases having somewhat higher-than-average production. Several of the points shown below the throughput of 100 bbl. per day are known to have been justified on the basis of completely automatizing given areas in order to permit real labor savings to be made.

Much has been heard about the number of days' emergency storage that should be provided with LACT systems. The distribution of emergency storage capacity used with the 99 systems covered in this survey is shown in Fig. 6. In many cases it was noted that the manually operated conventional storage had not yet been removed.

It is believed safe to assume that those installations which have, say, about 3 or more days' storage fall into this category. It is particularly interesting to note the number of installations which have emergency storage capacity ranging below one-third of a day and even down to zero in two cases.

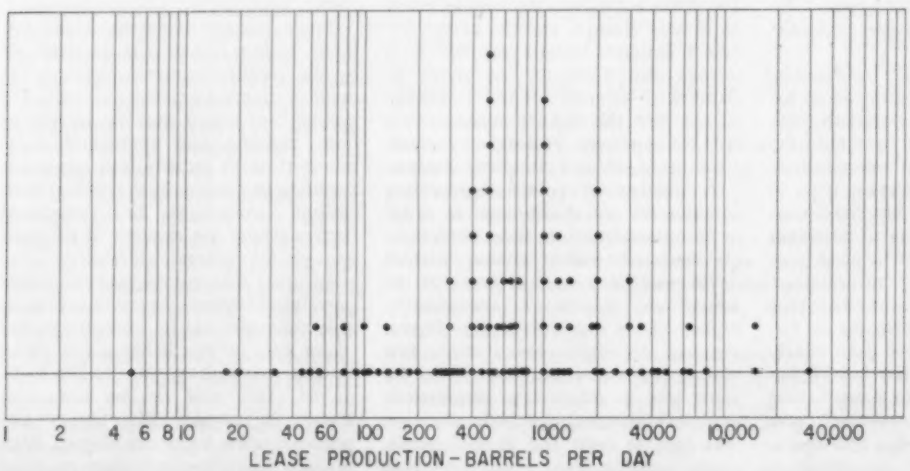
Industry practices . . . A number of percentages are also interesting to note from the survey data. Dielectric b. s. and w. monitors are used on 90% of the installations with the nonrecording type holding an almost three-to-one lead. Sixty per cent of the installations provide automatic diversion of nonmerchantable oil to the treating facilities, and 22% divert this oil to storage. Sixty-six per cent of the leases using LACT are equipped to shut in production in the event of malfunction.

Sixty per cent of all installations use a pipeline pump; however, in 46% of all cases a pipeline pump would have been required with manual operation. Of those 13 cases where a pipeline pump was used when it would not have been required for a manual battery, 8 are meter systems and 5 are tank systems. Sixty per cent of the installations use an allowable stop valve and 40% schedule runs by time clock.

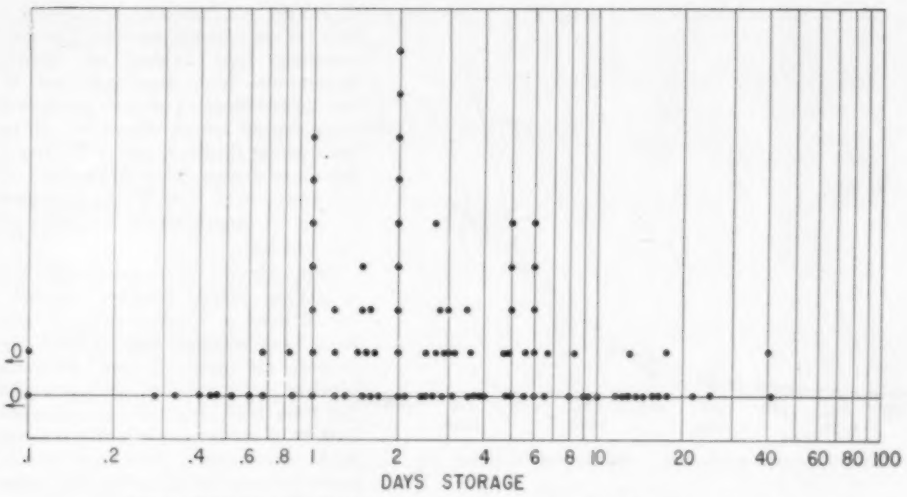
Eighty-six per cent of the installations were made on leases where oil is heat-treated. Ninety-one per cent of the installations use electrically operated controls, and the remainder are presumed to have pneumatic controls. Sixty-one per cent of the meter installations have only one meter; 10% use meters in series, and 29% use meters in parallel.

Ninety-eight per cent of the meters are temperature compensated and 92% use a ticket printer. Meter charging pumps are used in 74% of the meter installations, air eliminators are used in 65% of the meter systems, and 79% use strainers. Meters are proved 51% by prover tank, 31% by stock tank, 16% by master meter, and 2% by gravimetric means.

Success of installations . . . Two installations were reported unsatisfactory, but a quick check revealed that only minor difficulties, believed subject to easy correction, had been



LARGEST GROUPING of installations is in 500-1,000-bbl.-daily range. Fig. 5.



LITTLE EMERGENCY STORAGE is located at many LACT units. Fig. 6.

encountered and that these installations were not yet satisfactory for unattended operations. The consensus of individuals contacted during the inspection tour was that performance of LACT has been satisfactory.

Some difficulties were experienced with positive-displacement meters, such as failure of the temperature-compensating element and register-shaft decoupling, and a steady drift of meter factor in one installation which had not yet been explained. The latter was presumed to be due either to meter wear or to incrustation in the meter prover tank.

Some "teething" troubles have also been reported in tank systems, which have usually resulted from malfunction of the level sensing devices. In a few cases, sampling has been a problem, but not a very serious one. Some difficulties have been found in sampling the sample container, and some types of samplers have shown an error in proportionality caused by changes in line and sample container pressure.

In those unattended installations where run tickets are produced as infrequently as one per month, the operators were asked whether the pipeline gager found it necessary or desirable to make inspection trips in the interim between his scheduled visits. It was encouraging to note that there has not been such a need.

From the foregoing information, three important items seem clear. One is that the installations made so far, with few exceptions, have been widely scattered. Another is that LACT has generally been applied to leases having somewhat higher-than-average production. The third is that the operational use of LACT equipment is growing at such a high rate that immediate consideration by every producing and pipeline company is certainly justified.

Costs and Savings

Information has already been published concerning the costs of LACT systems and the savings that they produce. These costs have shown a wide variation because of the lack of sufficient actual cost figures. Final cost figures are now available on a number of installations that have been completed recently, and the picture is beginning to crystallize. Savings to be realized from LACT installations are still comparatively speculative, but some new information is becoming available which makes more reasonable estimates possible.

The composite cost curves shown in Fig. 7 have been prepared for various throughput rates for meter LACT systems, tank LACT systems, and conventional manually gaged tankage. The curve for manual tankage is based on 4 days' storage, and the curves for LACT batteries include one-half day's storage plus $500 for an alarm or shutdown system. The estimated curves for the LACT systems are felt to represent realistic minimum costs for good and complete systems.

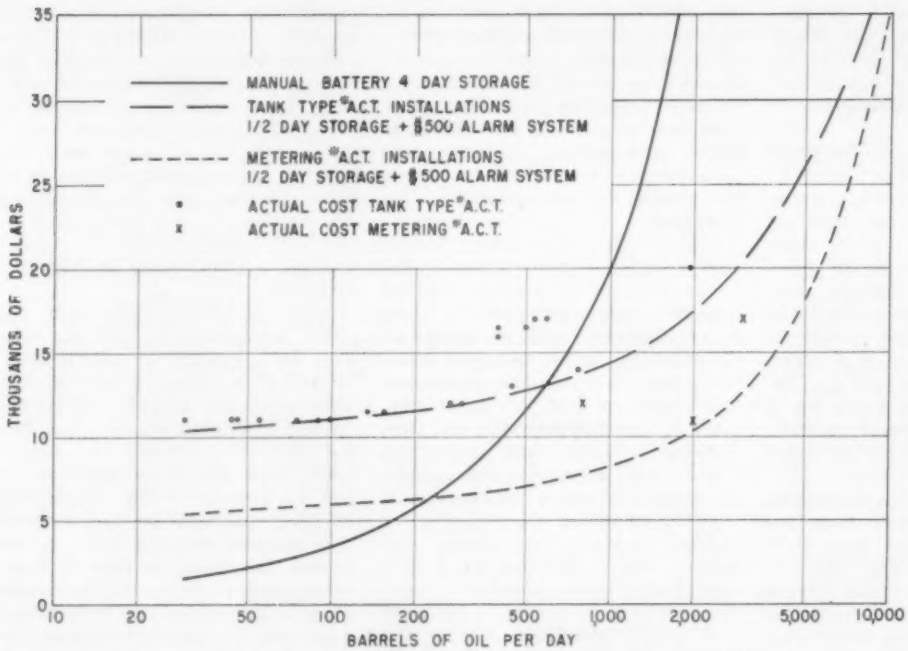
A number of points representing actual costs are shown and, in order to permit comparison, these costs have also been adjusted to include one-half day's emergency storage. Some of the actual cost figures are considerably higher above the curves for several reasons. In some cases, lower-cost equipment is now available to do the same job; in others, the installations were experimental and little attention was paid to cost; and in still others, every possible feature was added to insure successful operation.

On new installations, the savings in first cost accruing to the producer are simply the differences in cost between an LACT system and a manual battery. The breakeven point for tank LACT systems is shown to occur at about 600 bbl. per day and for meter systems at 250 bbl. per day. In addition to these savings in construction costs, continuing savings accrue through reductions in evaporation losses. By manual-gaging methods, these losses are generally agreed to be approximately 0.2° API gravity and 0.5% in volume.

Labor savings . . . Labor savings to the producer are difficult to pinpoint. Estimates have ranged from zero to $200 per month per lease, depending largely upon whether the producer's representative witnesses manual gaging. It can be assumed that this saving is small and could well be offset by additional maintenance costs.

Much has also been said about the labor savings which can be realized by the pipeline company through reduction of the frequency of visits for making run tickets and the savings to both pipeline and producing companies through reduction in run-ticket handling and accounting. Contact with several companies has produced figures which are thought to be good enough for general estimating.

In areas with no appreciable transportation problems and with a reasonable concentration of connections, the direct cost of producing a run ticket by manual tank gaging is about $4 or $5. This cost can be somewhat lower or considerably higher depending upon local conditions. With modern machine-accounting practices the cost of transcribing and calcu-



BREAKEVEN point for tank systems is 600 bbl. daily, for meter systems 250 bbl. daily. Fig. 7.

lating a run ticket is about 3 to 5 cents, which for our purposes is negligible.

Where calculation of run tickets is done by hand, however, these clerical savings could become significant. Appreciable savings to pipeline companies have also been reported through elimination of the errors associated with paraffin incrustation in tanks; however, since paraffin is a problem only in some fields and to varying degrees, a general estimating figure cannot be given for these savings.

Two items, formerly believed to be possible contributors to cost reductions, are no longer considered important in this respect. One is the possibility that more continuous runs from LACT installations would improve pipeline load factors and could, in new fields, permit use of smaller lines. This effect is now thought to be insignificant compared with the unknown factors involved in sizing gathering-system lines.

The other is the prospect that savings can be made by the use of automatic instruments for measurement of b. s. and w. and gravity, and that these instruments, in conjunction with other data-handling and communications equipment, can economically eliminate manual measurements and provide timely data to central offices.

It is believed that the cost of automatic b. s. and w. and gravity instruments will remain high enough to prevent a payout through reduction of the time required to make one manual measurement per month. The cost of automatic data handling and communications equipment is even higher, and generally lease-custody-transfer data are not required urgently enough to justify it.

As mentioned above, the justification for LACT is very clear for leases requiring tankage whose cost is greater than the cost of the LACT system chosen. But a great many leases have production less than the breakeven point, and on these the producer's only significant source of return for the added cost for LACT lies in the savings of evaporation loss. As shown in Table I, this is not enough to justify the smaller systems.

Assumptions in study . . . In preparing this table, a number of assumptions were made which may have considerable bearing on the validity of the payouts which are developed. First, it seems likely that with further develop-

Table 1—LACT Costs and Savings

	50 bbl. daily	100 bbl. daily	200 bbl. daily
Cost of meter LACT installation including 1 day's storage	$5,500	$6,000	$6,500
	two 100-bbl. tanks	two 200-bbl. tanks	four 200-bbl. tanks
Manual battery with 4 days' storage	$2,000	$3,000	$6,000
Direct additional cost for LACT	$3,500	$3,000	$ 500
Savings to pipeline by connecting, strapping, calculating tank tables, etc., for one tank instead of two or more tanks	100	100	300
Total net additional cost for LACT	$3,400	$2,900	$ 200
Savings to pipeline by making one run ticket per month rather than one per tank, assuming a cost of $5 per run ticket and deducting $10 per month for meter proving, per month	$ 60	$ 60	$ 135
Value of vapor savings to producer assuming 0.2° API gravity increase 0.5% volume increase, per month	$ 20	$ 40	$ 80
Payout from producer savings alone on direct additional cost, year	14.6	6.2	0.5
Payout from total pipeline and producer savings on total net cost, year	3.5	2.4	0.1

ment the cost of LACT systems, particularly in the small sizes, might be considerably reduced. Meters for very low throughput rates are not yet available in a quality comparable to that of the larger meters.

It is also possible, that on the small systems, more simplified controls with fewer safety shutdown features could be used; and in some cases involving low production rates, some items of equipment might be eliminated altogether. To pipeline companies, the assumptions made in Table 1 concerning the reduction possible in the number of run tickets is of major importance. The figure used for the number of run tickets made on a manual lease was assumed to be a reasonable average but has not been confirmed by statistical study.

Another unknown is the seriousness of the problem the small leases are going to present. Better perspective concerning these two items could be obtained by making studies of random samples of run tickets. Information gained from such studies would also be helpful as a basis for evaluating the empirical information obtained from operating installations.

Pipeline benefits . . . Keeping these limitations in mind it seems clear from Table 1 that the benefit to pipeline companies might be very significant and could be essential to the justification of LACT installations on relatively small leases. It is well understood that real operating savings can be made by pipelines only if the application of LACT is fairly general within a given area.

In existing fields there appears to be a likelihood that many leases with low production rates, by obstructing the general application of LACT, may significantly reduce the realization of potential benefits to producer and pipeline companies. In new fields initial production rates may be sufficiently high to justify LACT facilities in nearly all cases.

Need for Pipeline Initiative

Generally speaking there are two major reasons for pipeline companies to take a greater share of the initiative and leadership in the application of LACT equipment. First, without such initiative pipeline companies are not in a position to influence the installation of a sufficient concentration of facilities at locations to permit savings to accrue to the pipeline company. As can be seen in Table 1, savings accruing to producer and pipeline companies are of a completely different type.

The producer's savings are almost entirely due to a reduction in capital cost, which are far more pronounced on larger systems and which disappear altogether on small ones. The savings to pipelines, on the other hand, accumulate over the years through a reduction in operating costs and are largely independent of system throughput, but are dependent upon the number and concentration of installations.

So far, with few exceptions, LACT equipment has been provided by the producer. In only a few cases has the pipeline company purchased any major equipment such as meters or samplers, and for the most part it has been done to permit the pipeline to gain experience with this new equipment. It seems unlikely that any firm decisions will be made concerning allocation of costs until the division in savings becomes more clear.

In the meantime, the publishing of pipeline policies encouraging and guiding the application of LACT equipment should stimulate greater use of LACT by producers and can, with proper planning, improve the likelihood that material benefits will be realized by pipeline companies. Of course, this influence could be increased if the pipeline companies could find it possible to share in the capital cost of the installations.

Measurement accuracy control . . . The second reason for pipeline initiative stems from the need for pipeline companies to maintain good control over measurement accuracy. Traditionally and logically, and in some cases legally, this control has been and should remain the primary responsibility of the pipeline companies. Certainly, more effective control can be maintained if the pipeline companies establish policies which encourage and lead in the establishment of good system designs which will allow ease in "auditing."

Along with the improved control over measurement accuracy, which can be expected through pipeline leadership, there is the fact that pipeline companies with their relatively large number of connections in a given area are in the best position to provide efficient and well-controlled inspection and calibration services.

This is particularly meaningful in the case of meters where pipeline companies might be expected to provide an efficient meter-proving service; and, if their savings should warrant it, they might also provide efficient meter and auxiliary equipment repair and maintenance service.

Pipeline LACT Policy

A consideration of all of the aspects of automatic custody transfer should allow a pipeline company to set forth a policy which provides a basis for negotiation and planning by both producers and that pipeline company. Such a policy promulgated by one pipeline company is given here in the hope that it will be of some use by other companies in establishing a policy of their own. In considering the drawing up of a policy such as this, API Bulletin 2509-A on LACT provides a good source of basic information.

While it is recognized that the policy presented here does not provide for allocation of capital costs of an LACT system, it does provide that the pipeline company will assume the cost of proving meters where they are used. It is believed that such a policy will encourage the use of LACT in spite of the absence of financial assistance on capital costs. It is intended that this policy be reviewed from time to time as more information is gained on the extent of pipeline savings, and it is recognized that new developments may require its revision in the future.

One company's policy . . . When permitted by state and/or federal law and regulations, the pipeline will receive crude oil on the basis of unattended custody-transfer measurement so long as it is satisfied as to the accuracy of the measurement and the ability of the facility to sustain this accuracy. Facilities for unattended custody-transfer measurement may consist of positive-displacement meters, weir tanks, or dump tanks.

. . . Design and construction. It is the custom in the petroleum industry that the producer furnish required tankage for storage and measurement of crude oil. It is this savings in tankage which allows primary savings in capital investment when LACT facilities are installed. In view of this economic factor, the design, construction, and cost of unattended custody-transfer facilities will be the responsibility of the producer.

Designs of facilities which are to be used for custody transfer must be acceptable to the pipeline from the viewpoint of engineering and measurement standards as outlined below and must conform to applicable API codes or standards. Further, operations and measurements must allow conformance with governmental regulations. Where the fluid is started and/or stopped automatically, separate control panels must be provided so that controls affecting quantity and quality measurements to the pipeline can be sealed.

1. Volume measurements. All unattended measurement devices must be

capable of consistently measuring volume within 0.1%.

2. Temperature measurement. When positive-displacement meters are used, they may be temperature compensated. When non-temperature-compensated meters or tank measurements are employed, temperature recorders must be installed.

3. Mechanical samplers. When b. s. and w. and gravity determinations are to be made from composite samples collected by mechanical sampler, the sample collected must be representative of the crude-oil stream.

4. Merchantable petroleum liquid. When there is a possibility that crude oil will not meet required specifications for b. s. and w., a dielectric instrument must be installed which will automatically stop the delivery to the pipeline of any off-specification liquid.

5. Vapor pressure and liquid stability. In facilities utilizing positive-displacement meters, the producer shall supply sufficient head to insure that the liquid being delivered to the positive-displacement meters, when the meters are operating at rated capacity, is at a pressure reasonably in excess of the bubble point of the liquid and within the vapor pressure set forth in the applicable tariff.

Liquid accepted by meter or dump tank must be stabilized so that subsequent tankage-filling losses will be within limits normally accepted by industry.

... Pumping equipment. Accumulator-station pumping equipment will usually be installed and operated by the pipeline. Where it is necessary to install auxiliary pumping equipment to furnish sufficient head to unattended custody-transfer facilities and to insure flooded accumulator-station pumps, such auxiliary pumping equipment will be installed by the facilities' owner and the energy furnished by him.

... Calibration and maintenance. The pipeline will provide and operate a portable, volumetric meter-prover tank. If it is impractical to transport this tank to the unattended facilities, or a larger tank is required by API standard or desired by the producer, such calibration tank must be provided at the producer's expense as part of the custody-transfer facilities.

Similarly, only a low-head pump will be provided to empty the prover tank. If high pressures are required to return the oil to the line from the prover, this equipment must be furnished by the producer.

In most cases, the pipeline will assume responsibility for periodic calibration of unattended custody-transfer facilities, including automatic controls and equipment used to determine oil properties, to insure measurement accuracy. If desired by the owner, the pipeline will be responsible for maintenance of these facilities and such expense (direct labor and materials) will be charged at actual cost to the owner.

These services are considered conveniences rendered the producer, where qualified personnel are available, and the pipeline reserves the right to determine whether or not these services can be rendered. Where calibrations are made by the producer, these calibrations will be witnessed by a pipeline representative.

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How dispatchers can help cut operating costs

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BY FRED M. SPRINGER
Magnolia Pipe Line Co.

WHEN THE WORD "dispatching" is mentioned, the first thought that comes to mind is the hourly and daily recording of information—the accounting of daily operations on a permanent record.

I wonder if persons outside the dispatching department ever think of this time-consuming record keeping as anything more than a statistical record of pipeline operations. Do they realize that efficient operation of the pipeline system depends upon the dispatcher's continuous analysis and interpretation of these data?

Efficient physical operation of the pipeline system is the dispatcher's primary responsibility, and an up-to-the-minute account of operations is indispensable to the accomplishment of this purpose.

In some locations the dispatcher has the controls of the pipeline at his finger tips through the use of telemetering and remote controls. In other cases the dispatcher may operate the pipeline by using telephone or telegraph to receive information and to send instructions and orders. In both types of control, the dispatcher has the facilities to operate the entire pipeline system minute by minute and hour by hour.

No other man in the pipeline organization is constantly as close to the entire pipeline system as is the dispatcher. The very nature of his position charges him with a tremendous responsibility—a wrong instruction or decision can cost heavily, while a good decision may result in substantial savings which are never brought to light.

Dispatcher Training

Perhaps the reason that we hear so little about effective dispatching as an instrument of cost control lies in the fact that the dispatcher's influence upon costs is not revealed in the ordinary cost analysis. The dispatcher must be trained to recognize these hidden costs in order to minimize them in the performance of his daily tasks.

This is one of the biggest problems in organizing an efficient dispatching department; that is, the thorough training of the dispatchers. A new dispatcher is so engrossed in the details of proper accounting and recording of data that it is difficult to impress upon him the importance of using these data.

He must be trained to recognize the effects of light and heavy grades during displacements, the wasting of power through ineffective use of a pump's capacity, the causes of pressure drops and what to do about them, the value of time and schedules with respect to terminal and refinery requirements, and the effect of control equipment and what it will do, to mention only a few.

He must have a thorough knowledge of pipeline hydraulics, training which the average pipeliner does not receive. Of course, he does not need the detailed knowledge of this subject that the engineer has, but he must be able to calculate pressure loss, determine head pressure, calculate displacements, and be able to determine the pressures required under specific operating conditions. He must also be familiar with the different types of pumps and machinery in order to operate the proper combination of equipment in a particular situation.

Cutting Power Costs

Considering the large trunk lines in operation today and the increasing use of closed systems and electrically driven centrifugal pumps, one of the most common hidden costs in pipeline operations is the waste of electrical power. This cost slowly creeps upward in almost unnoticeable amounts unless the dispatcher keeps a constant watch on operations and learns to recognize causes when they appear.

An instance in which this may occur is the handling of displacements of a particularly light grade against an extremely heavy grade. The difference in viscosity of the two grades will cause considerable variation in pumping conditions as the grades move

(Continued on page 145)

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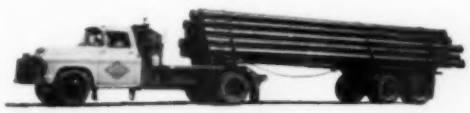

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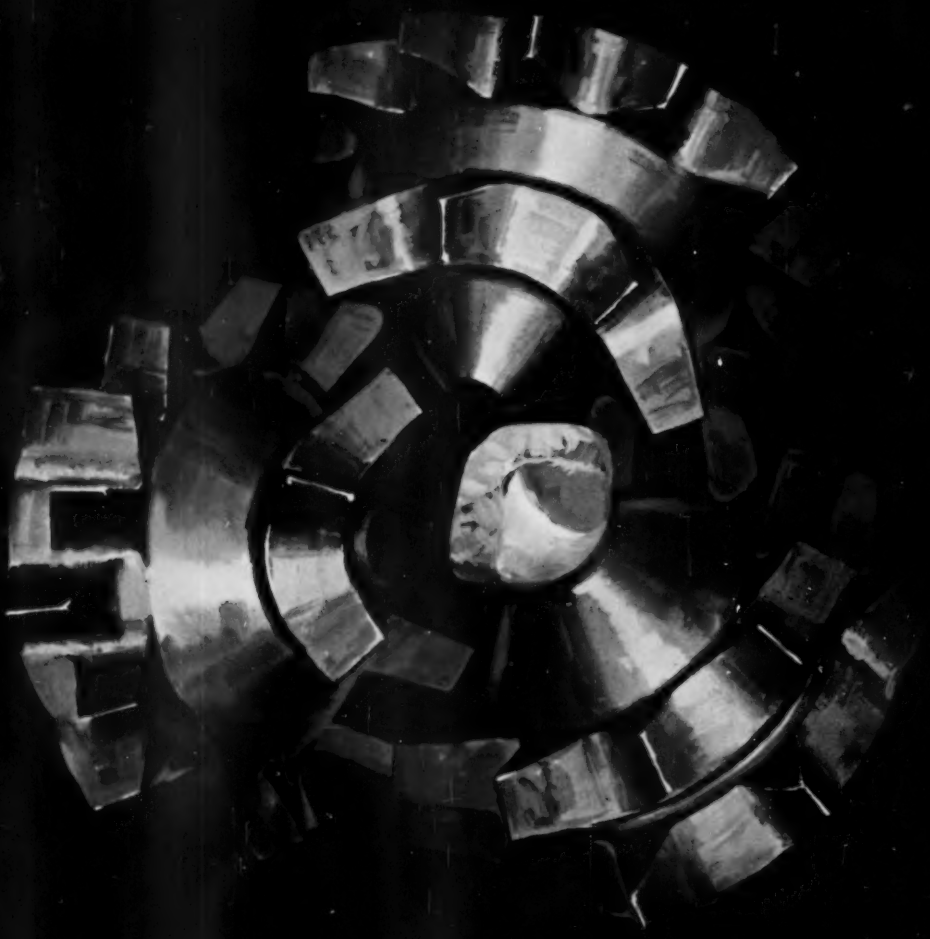

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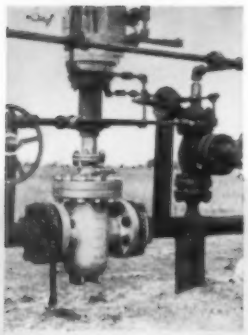
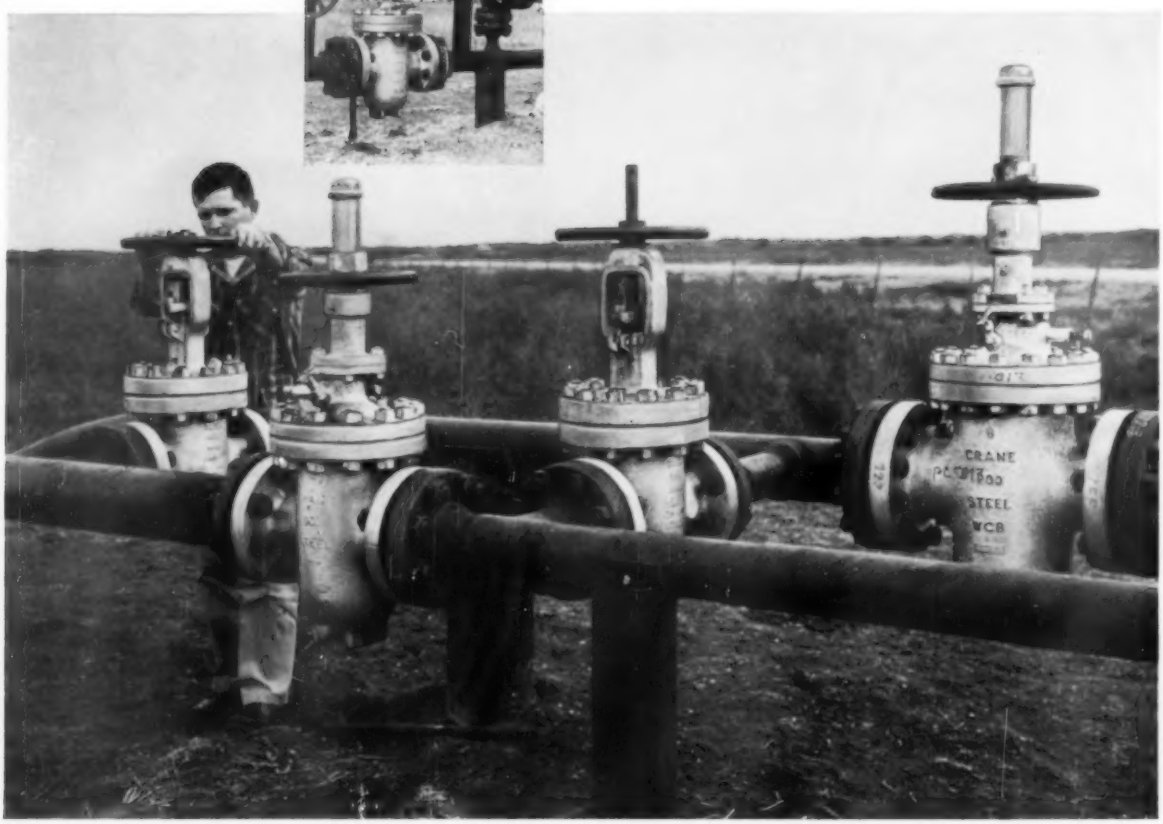


Left—Crane conduit-type valve with automatic operator at one of six stations.

Below—4- and 6-inch Crane conduit-type valves at scraper trap setting in 70-mile ethylene line.



Ethylene Handled by Crane Conduit Valves in Phillips Chemical's 70-Mile Line

Phillips Chemical Company's ethylene pipeline from the Sweeny refinery to its Pasadena, Texas, plant crosses some 70 miles of rough, jungle-like country.

Valving for the line had to be specially designed to protect against product loss, and to insure safety.

All the line valves are new-type Crane conduit gates, Class 600 and Class 900. At six locations they are equipped with automatic operators. Should line leakage cause a pressure drop of 30 to 40 pounds, these valves will close automatically in 22 seconds. Other conduit valves are installed in the scraper trap settings.

Since they were installed a year and a half ago, these valves have operated without trouble of any kind. They close tightly and easily, and require no maintenance or periodic lubrication.

Both the *new* Crane conduit valves and the companion line of Crane double-disc pipeline valves are described in Crane Catalog AD-2198. A request to the address below or a call to your local Crane outlet will bring a copy quickly.

ASK FOR CATALOG AD-2198—Completely covers the new companion lines of Crane conduit-type and double-disc pipeline valves.

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THE AUTHOR

Fred M. Springer is division engineer, western division, Magnolia Pipe Line Co., Midland, Tex. A 1949 graduate in mechanical engineering from Missouri School of Mines and Metallurgy, he was employed by Magnolia Pipe Line as a machinist's helper after graduation. He has held numerous field operating jobs and has spent 3 years as mechanical engineer in the oil-movements department, having close contact with dispatching and dispatching problems, including preparation of operating instructions.

Paper presented at annual pipeline conference, API Division of Transportation, New Orleans, March 31-April 1, 1958, under original title, "Dispatching—an Aid in Controlling Operating Expenses."

through the system. The viscous crude will slow the line down to the extent that the stations pumping the light crude will be using excess power unless the dispatcher makes continuing adjustments at all stations to keep the line operating most efficiently under the circumstances.

An example of this type of situation would result on a line in which 40° API gravity oil is batched against a heavier 30° API gravity oil of much higher viscosity. As the light crude displaces the heavy, the line will have slowed down to the extent that the control valve at the station closest to the displacement will be pinching heavily on the second pump of a two-unit station.

In a case such as this it is possible to shut one unit down and operate on high suction pressure until the displacement has moved a sufficient distance down the line to allow for efficient two-unit operation again. The saving in power would increase with the frequency of displacements and would depend upon the length and size of line as well as the size of pumping units.

Scraper program . . . Another source of wasted power is the dirty line where internal corrosion, paraffin, dirt, or other foreign matter causes undue pressure loss between stations. This will cause higher pressures and thus higher cost when a more economical operation is possible with a properly maintained scraper program. By a proper scraper program I do not necessarily mean an every-2-weeks type of schedule, but a flexible program in which the dispatcher or his supervisors run scrapers to the best advantage.

It is equally important to be able to recognize the danger signs which point to the need of a scraper run. Waiting until the line slows down or until pumps are inefficiently operating is to wait too long, and it takes an alert and well-trained dispatcher to recognize the danger signs in their early stages.

A situation in which this might occur would be in a cold climate where a paraffin-type crude would tend to leave heavy deposits on the walls of the pipeline, especially in winter months. An effective scraper program as compared to a ineffective or partially effective program will result in a decided increase in line throughput and efficiency.

An increase in volume handled of only 1,000 bbl. per day would result in a substantial increase in tariff revenue as well as lower operating costs per barrel. On an assumed 15-cent per barrel tariff, this would amount to increased earnings of more than $50,000 per year on the 1,000 bbl. per day increase alone.

Best pumping combination . . . When lines are operated below capacity, the dispatching department must make a careful study of the line requirements and the horsepower available in order that the most efficient pumping combination may be used. It is very easy to run too much equipment and waste power by pinching or bypassing on the pumps for the desired throughput, a situation against which the dispatcher must be on constant guard.

It is often found that no one pump or combination of pumps will give the required throughput. In this case units must be alternated and the line increased and reduced to give the desired capacity while still utilizing all the horsepower available.

Consider the problem when a line schedule of 120,000 bbl. per day is required for a line of 130,000-bbl. per day capacity. To reduce the line to the next lowest pump capacity would result in a throughput of only 100,000 bbl. per day, which would not be sufficient to meet the demand. The first and simplest recourse would be to operate the equipment for 130,000 bbl. per day rate and bypass or pinch for the desired throughput.

The horsepower wasted by such a schedule would result in a sizable increase in operating costs, even for only a 30-day period. A more efficient solution would be operation of the line at the 100,000 bbl. per day rate, increasing to full capacity of 130,000 bbl. per day on certain days or for certain periods to give the required average for the scheduled period at the lowest operating cost possible.

Equipment checks important . . . The dispatching department must make a constant review of pumps and pumping equipment to be certain that the most efficient type of installation is being used and that units are operating at their rated capacities. This includes recommending changes in liners or impellers where necessary to give the required throughput. It is especially important where lines are operating below capacity for extended periods of time or where future forecasts indicate decided changes in line operations.

This type of constant analysis can result in substantial savings through more efficient operation and use of pumping equipment. An example of the savings which can be realized by this type of analysis would be on a long closed-system line with identical pump stations.

If one of these pumps is failing to develop the required pressure for any reason, the one unit will serve as a bottleneck for the entire line and reduce throughput as well as increase operating costs at all the other stations. Close analysis of the day-by-day operations of this line will reveal such a situation and result in the necessary corrective action to increase throughput and lower costs.

There may also be instances when a station on lines operating below capacity is subject to a standby charge for power whether operating or not. Such situations should be thoroughly checked by the dispatching department when deciding upon the pumping combination for the line. To accomplish this, the dispatching department must be kept informed of power contracts and the particular clauses that they contain.

For each 1,000 bbl. per hour of throughput, 1 lb. of pressure wasted is ½ hp. wasted. If the dispatcher watches the line and pumps closely he will aid in controlling operating expenses by eliminating, or at least keeping to a minimum, the waste of horsepower and power cost.

Cutting Manpower Costs

The dispatching department, through its scheduling of pipeline operations, has a direct bearing on the work and assignment of personnel. The dispatcher then has a definite responsibility in controlling labor cost, a major operating expense.

Where a pump station is operating below capacity, it may be possible to reschedule line operations to permit the station to operate on a parttime

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Clean-sweep, all-season control of weeds, grass, and brush — from emergence through the full growing season — is the job Nalco H-174 *Dry* Weed Killer can do for you.

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basis. There are also occasions when careful scheduling may permit a station to shut down on holidays, weekends, or other special days. The saving in premium pay for one holiday at a one-man per tour station would be about $100. Considering all the possible pump stations and holidays, this one item alone would be a sizable reduction in operating costs.

These two areas are not the only ones in which dispatchers influence manpower expense. In directing activities during emergencies and scheduling special work and projects, the dispatcher must consider labor costs. During emergencies the task of directing personnel becomes the dispatcher's responsibility, at least during the early stages. In his position of coordinating the entire system's operations, the dispatcher has a better over-all picture of the emergency than the local personnel. Therefore, he is in a position to direct the needed personnel without sending more than is required.

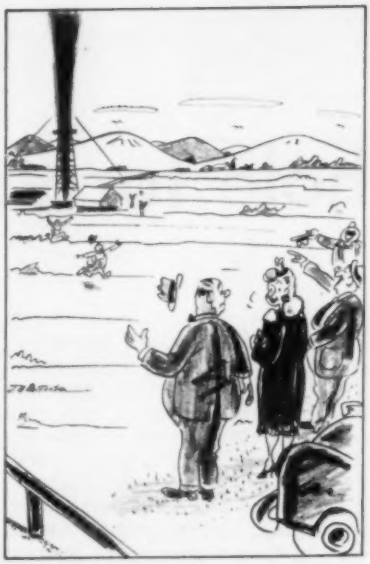
When scheduling special work and projects, the timing of pipeline movements will greatly affect the work requirements of field personnel. The proper scheduling of a project results in a minimum of shutdown time on the pipeline system as well as reducing manpower requirements and overtime to a minimum.

Proper scheduling of operations will reduce manpower costs with respect to deliveries to other companies, scraper operations, cleaning settling tanks, and other routine operations. This is especially true of mechanical or electrical work, in which cases the line schedules must be revised to allow the work to be done. In many cases, the request for work is initiated by the dispatcher; thus he determines the urgency of the request. Often the line operations can be adjusted to prevent any overtime work, or at least keep it to a minimum.

Accident Leakage

One of the most important duties of the dispatcher is the control of shortage and accident leakage. This is wholly a dispatching problem, requiring a thorough knowledge of dispatching and of the line being dispatched. An experienced dispatcher has a complete working knowledge of the pipeline system he is dispatching and has close at hand maps and profiles necessary for quick reference.

The most common indication of a leak is a drop in pressure. However, we have found that only about 5% of all pressure drops turn out to be leaks. The remainder can be traced to some specific operating problem, such as loss of suction pressure, air or vapor pockets, and equipment failures.



"Oh, yes, I've seen one before—out in Yellowstone National Park."

In any event, the dispatcher must make a quick decision as to the cause of the pressure drop. If he determines that there is a leak, he must act immediately to prevent excess loss.

The first recourse when notified of a pressure drop is to walk or fly the line in an attempt to locate any leaks. Considering that only a few pressure drops are actually caused by leaks, a considerable saving can be realized in the use of patrol planes and line walkers.

A patrol plane ordered out on the line when the pressure drop is caused by a vapor-locked pump can be very costly, while on the other hand a patrol plane not ordered out in the case of a leak can also be very costly. This discretion rests with the dispatcher for he is in a position to analyze the situation and decide the proper course of action.

In deciding whether a leak has occurred and what should be done, the dispatcher is in a position to control operating expenses in a very real way. A good, experienced dispatcher can save many barrels of oil each year, both in leaks and in increased line throughput, by making quick, sound decisions.

Future Demands

Every pipeline operates to supply a consumer with a specific product, whether it be crude oil to a refinery or gasoline to a sales terminal. In either case, advance planning is necessary in order to handle the demand efficiently. The supervisory personnel of the dispatching department must be kept posted as to future requirements at refineries and terminals as well as all proposed expansions, repairs, and connections to the pipeline system. They are then able to schedule operations to produce the required throughput and deliveries at least cost as well as recommend alterations in the physical system to meet demands efficiently.

Nelson Refinery Construction Index

Appears in the Engineering Section in the first issue each month.
Compiled by W. L. Nelson, petroleum refinery consultant, Tulsa.
The Index was explained October 1, 1956 (page 110), as well as the Indexes of Individual Items of Equipment that appear on the Costimating page in the first issue of the months of January, April, July, and October.

	Index (1946 = 100)					
	1950	1954	1955	1956	1957	Dec. 1957
Pumps, compressors, etc.	138.2	166.5	172.2	192.0	206.7	212.9
Electrical machinery	134.9	160.0	162.5	175.0	188.9	191.1
Internal-combustion engines	126.0	150.5	153.2	164.0	173.9	177.1
Instruments	127.8	154.6	162.9	182.1	187.4	193.2
Heat exchangers	140.0	171.7	156.8	190.7	203.6	203.4
Miscellaneous equip. average	*126.2	160.7	161.5	180.5	192.1	195.5
Materials component	149.5	174.6	176.1	190.4	201.9	203.4
Labor component	144.0	183.3	189.6	198.2	208.6	2142.
Nelson construction index	146.2	179.8	184.2	195.3	205.9	209.9

*Used in computing the Nelson Index until April 1952. This is slightly different from the average of the Miscellaneous Equipment Items shown above.

How to get the

Most hole for your money

PART 2

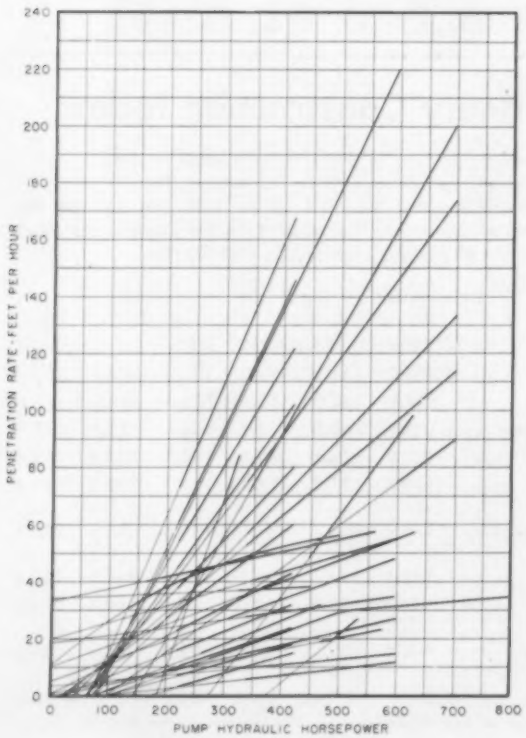
Drilling engineers are always faced with the problem of how to drill the hole at the least possible cost. In the March 31 issue of The Oil and Gas Journal, John W. Speer listed some of the factors which affect penetration rate and, ultimately, the cost of drilling the hole. Here, in the concluding portion, Speer tells how to arrive at near-optimum drilling techniques in the shortest possible time.

BY JOHN W. SPEER
Shell Oil Co.

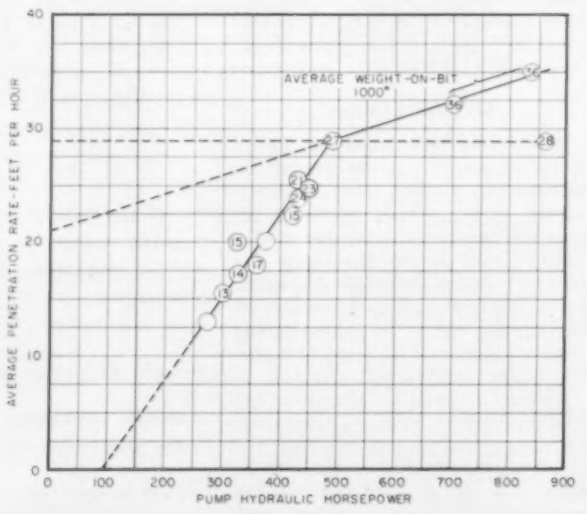
THERE IS NOT a good, all-purpose unit for expressing the effect of hydraulic horsepower on bit performance. For various purposes, units used are: (1) pump hydraulic horsepower; (2) circulating rate; (3) jet nozzle fluid velocity; (4) hydraulic horsepower across the bit; (5) momentum of nozzle fluid; and (6) annular rise in velocity. Each of these units expresses a part of the characteristics of a circulating system; no one unit completely defines conditions of a particular operation. The all-inclusive unit "pump hydraulic horsepower" best suits the purpose of this study because more field data are available for study of the effect of pump hydraulic horsepower than any other factor, and because it is the unit ultimately needed to describe the equipment required for optimum drilling techniques. The other units will be discussed as related thereto.

Before attempting to determine the influence of hydraulic horsepower on drilling efficiency, it might be expedient first to think about the way in which hydraulic horsepower can affect bit performance. The circulating medium does not destroy rock, it clears away the rock destroyed by the bit. In accomplishing this, its functions are: (1) to remove the cuttings from the bottom of the hole rapidly to prevent recutting; (2) to clean the cutters so that the teeth are free to penetrate the rock; and (3) to carry the cuttings up away from the bit so as not to interfere with bit life. Consequently there is a critical hydraulic horsepower for each weight on bit in a specific formation (and for all the other specific conditions related to the environment at the bit) which provides adequate bottom-hole scavaging for maximum efficiency.

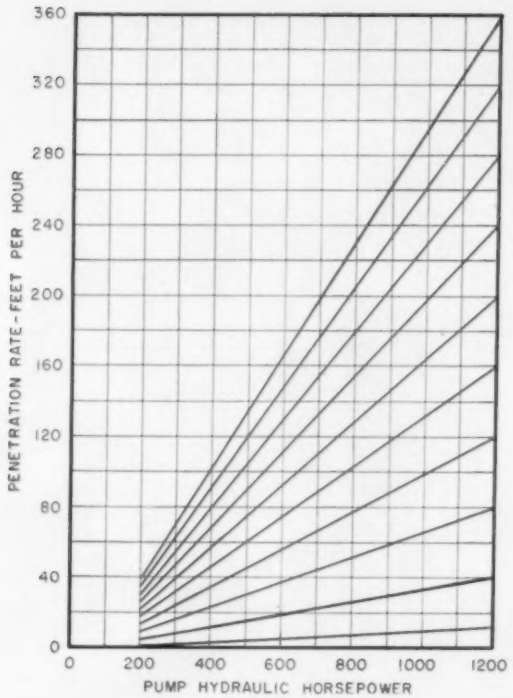
Varying hydraulic horsepower above



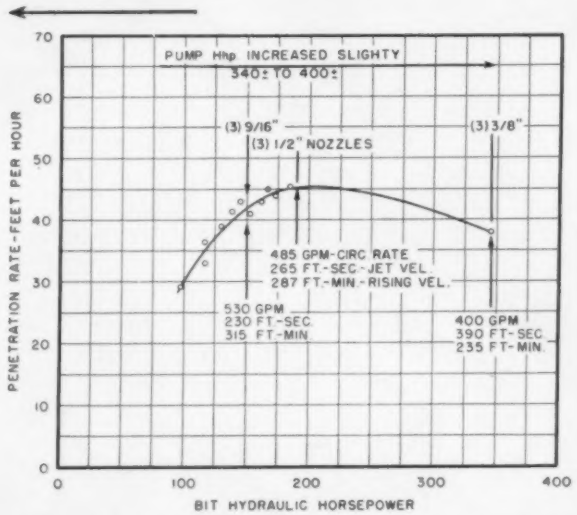
A LINEAR RELATIONSHIP is apparent between pump hydraulic horsepower and penetration rate. Fig. 13.



THIS CURVE is based on over 100,000 ft. of hole. Notice the linear relationship between 275 and 490 hydraulic horsepower. Fig. 14.



PENETRATION RATE varies linearly with pump hydraulic horsepower under any specific conditions; or, the hydraulic horsepower required to maintain clean bottom-hole conditions varies linearly with weight on bit. Fig. 15.



EXAMPLE of optimum utilization of pump horsepower. The use at the bit of about 55% of total hydraulic horsepower proved most effective. Fig. 16.

this critical value has no effect on penetration rate, whereas reducing it below critical would permit balling up and recutting and thereby reduce penetration rate and bit life. Therefore, in the classic sense where maximum weight is used with each value of hydraulic horsepower, hydraulic horsepower can affect bit performance only by limiting the amount of weight that can be used. It is in this sense that reference is made to the effect of hydraulic horsepower on penetration rate in the following discussions.

Field results which indicate the relationship between pump hydraulic horepower and penetration rate are shown graphically in Fig. 13.[6 9 9a] Most of the 33 groups of data consist of two or three points, which accounts for most of the curves being straight lines. There is a consistency in these straight lines, however, which appears to indicate a definite relationship between hydraulic horsepower and penetration rate. With each of the curves extended downward and its intersection with the base of the graph noted, there is the following distribution:

1. Nineteen curves (58%) intersect the abscissa between the origin and 100 h.hp., and 12 curves (38%) intersect between 60 and 100 h.hp.

2. Nine curves (27%) intersect the vertical axis.

3. Five curves (15%) intersect to the right of 100 h.hp.

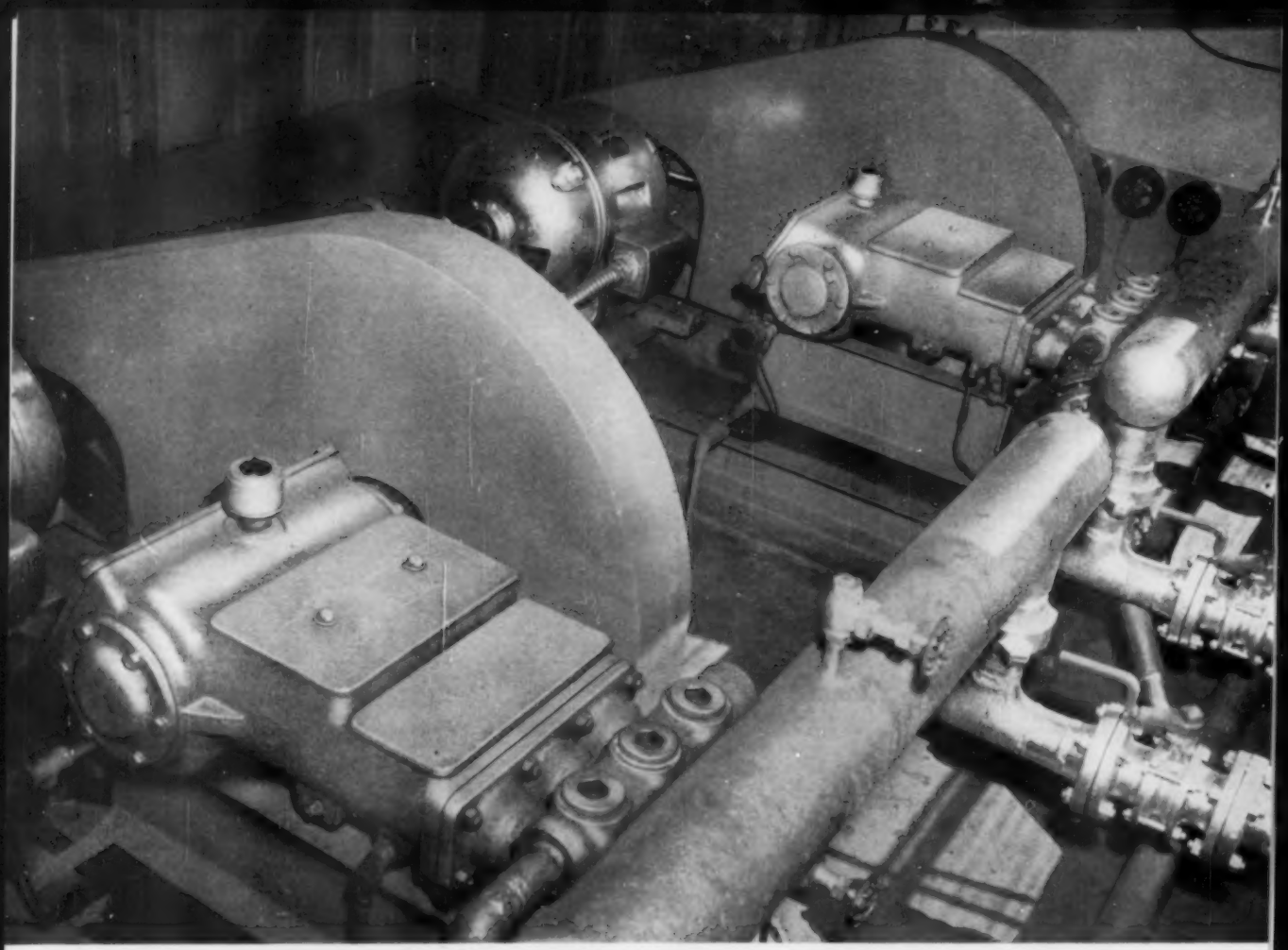
Thus, these results show relationships varying from (1) no influence of hydraulic horsepower, to (2) a linear relationship with an apparent origin at 80± h.hp. In addition, a few scattered data indicate an even greater influence of hydraulic horsepower. This latter group is erratic, and probably can be discounted as reflecting influences of factors other than hydraulic horsepower, such as variations in formation drillability. Considering the remaining 85% of data, the concentration of data increases progressively from "no improvement" from hydraulic horsepower to the linear relationship with an apparent origin at 80± h.hp. This is approximately the range of data expected from field results, as discussed earlier. There remains only the problem of determining what factors could suppress the influence of hydraulic horsepower in field practices.

This is demonstrated in Fig. 14 with data well established through the drilling of more than 100,000 ft. of hole. Average penetration rates for the interval 1,000 to 10,000 ft. in Ventura field, California, are plotted with average pump hydraulic horsepower for this interval. Average weight on bit is also shown for each well. For the range 275 to 490 h.hp., weight on bit was varied appropriately and penetration rate increased linearly with hydraulic horsepower From 490 to 840 h.hp., weight was increased only from 27,000 to 36,000 lb. (33%) because of hole-deviation problems, and the full advantage of the increase in hydraulic horsepower was not obtained. The lower section of the curve, 275 to 490 h.hp., appears commensurate with Group 1 (58%) of the assorted field data plotted in Fig. 13. The section from 490 to 840 h.hp. appears to be commensurate with Group 2 (27%) of these data — presumably results for which weight was not increased along with hydraulic horsepower. A shift of the apparent origin to 80± h.hp. is logical because some circulation to carry cuttings would be required before any drilling could be done.

Therefore, penetration rate under any specific condition* varies linearly with pump hydraulic horsepower, with an apparent origin at about 80 h.hp. as shown in Fig. 15. Actually, this conclusion might better be stated: the hydraulic horsepower required to maintain clean bottom-hole conditions varies linearly with weight on bit. Because penetration rate varies in a direct proportion with weight on bit, penetration rate would also vary linearly with hydraulic horsepower, if maximum weight were used.

Increase in hydraulic horsepower will produce an increase in penetration rate even when not accompanied by an increase in weight, under cer-

*Specific condition includes constant formation, depth, drill string, bit, hydraulic-horsepower utilization, and rotary speed.



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The Bethlehem line includes two triplex models—the TP-3 and the somewhat larger TP-4. These are unusually rugged units with a controlled gravity-flow lubrication system. Oil floods the power end at all speeds, high or low, and the system starts up with the first turn of the gears. Positive, dependable lubrication is one of the reasons why TP's can be operated continuously under full load.

Fluid ends are available in molybdenum alloy iron, cast steel, and aluminum-bronze, and in all cases the proper complementary trim is furnished. Plungers are of hardened steel, stainless steel, or solid ceramic. This range of combinations makes the TP's suitable for many uses—not only in waterflooding and disposal work, but also in crude-oil gathering and the handling of refinery products.

The pumps can be fitted with an optional speed-reducer, which is easily installed in the field. This device is adaptable for either right-hand or left-hand drive, and can of course be used with standard oil-field engines or motors.

In addition to its TP triplex units, Bethlehem makes duplex models known as the U-series. Thus it is possible to select exactly the proper size and type of pump to meet your needs. When you are next in the market, get complete information from the nearest Bethlehem office.

BETHLEHEM GENERAL-SERVICE PUMPS

Model	Type	Plunger Load, lb	Input hp	Bore & Stroke, in.
TP-3	Triplex	3580	36 @ 400 rpm (max)	1¾ to 2¼ x 3
TP-4	Triplex	5000	67 @ 400 rpm (max)	2 to 4 x 4
U-33	Duplex	2400	13 @ 160 rpm	1¾ to 3 x 3
UA-46	Duplex	5000	40 @ 120 rpm	2½ to 4 x 6
U-510	Duplex	12000	100 @ 75 rpm	3 to 5½ x 10

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tain circumstances. This can be demonstrated with the data that were shown in Fig. 3. (Part 1 of this article). Consider the condition on curve A of 20,000 lb. weight and a penetration rate of 65 ft. per hour. When hydraulic horsepower across the bit was increased from 210 to 260, penetration rate increased to 80 ft. per hour, even without an increase in weight, because the additional hydraulic horsepower reduced balling up. Likewise, further increase in hydraulic horsepower to 340 produced an additional increase in penetration rate because the balling up condition was further reduced.

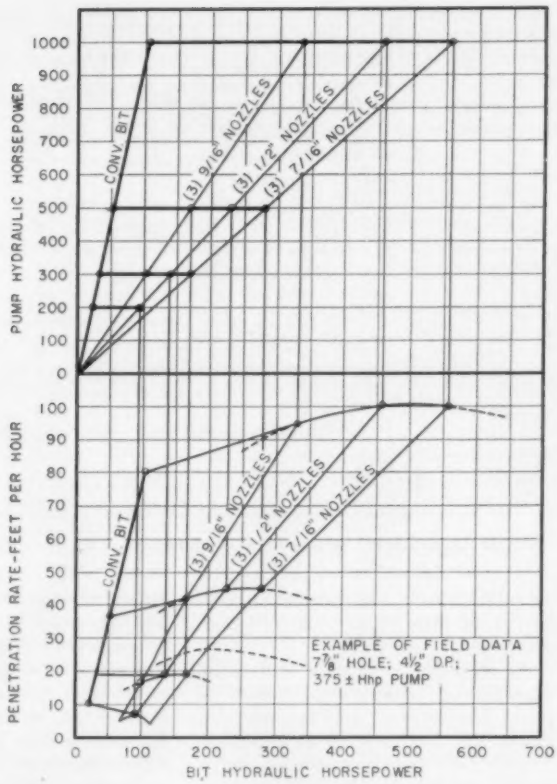
So far, only pump hydraulic horsepower has been considered, without regard to the efficiency of application. As hydraulic horsepower is both pressure and volume, some evaluation of the two is needed. Cleaning action at the bottom of the hole is primarily a function of volume and velocity; velocity at the bit is proportional to the square root of pressure differential. Cleaning of the hole is primarily a function of circulating volume. Thus, an understanding of annular rising velocity, total circulating rate, and nozzle fluid velocity is needed.

There is not a good criterion for minimum annular rising velocity; this will vary with hole condition and type of formation penetrated. Also, minimum acceptable rising velocity seems to vary inversely as hole size. Rising velocities of about 90 ft. per minute have given satisfactory results in 12¼-in. holes, while velocities over 300 ft. per minute have been unsuccessful in eliminating stuck-pipe problems in 3-in. hole sizes. For normal drilling conditions, the following annular velocities for various hole sizes seem to be acceptable, although not optimum for maximum efficiency.

Hole size (in.)	Annular velocity, ft. per min.
15	80
12¼	90
10⅝	110
8¾	120
7⅞	130
6	140

This variation by hole size would indicate that some criterion besides annular velocity is needed. Probably circulating volume vs. cross-sectional area of hole, or diameter of hole, would be more definite. On this basis the following formula seems to give reasonable results: (hole diameter—inches) ^{2} x 5 = acceptable circulating volume (g.p.m.)

Minimum nozzle velocity for effective jet bit use is also an elusive figure, although it seems reasonable that a minimum velocity should exist. The circulating fluid performs two scavaging functions at the bit; it cleans the bottom of the hole, and the cutter teeth. The jet stream is directed at the bottom of the hole, and fluid turbulence is depended on to clean the cutters. If nozzle fluid velocity is too low to create enough turbulence to clean the cutters, the clean hole bottom goes for naught and the bit balls up anyway. In contrast, the circulating fluid through a conventional bit impinges directly on the cutters, and less velocity is required to keep the bit clean. However, large circulating volumes are required to clean bottom of the hole, and this may erode and fluid cut the cutters.



JET BIT performs better than the conventional at 500 hydraulic horsepower and above. Fig. 17.

In comparison with conventional bits, improved performance has been obtained with jet bits in "soft" formations with nozzle velocities as low as 170 ft. per second. On the other hand, results have indicated only minor improvements with jet bits in "medium" formations with nozzle velocities as great as 350 ft. per second. This seems to indicate a minimum nozzle velocity for effective jet-bit action, as well as an optimum formation for jet bits, which will be discussed later. Of the results available for this study, the only applications wherein conventional bits performed better (cost per foot) than jet bits were with nozzles velocities below 220 ft. per second. Thus, it would appear that minimum nozzle velocity to insure effective jet-bit use might be in the order of 225 ft. per second, whereas some improvement might be obtained in soft formations with velocities as low as 170 ft. per second.

Bit hydraulic horsepower can also be used to describe circulating conditions; however, it also requires qualifications. Bit hydraulic horsepower is defined as follows:

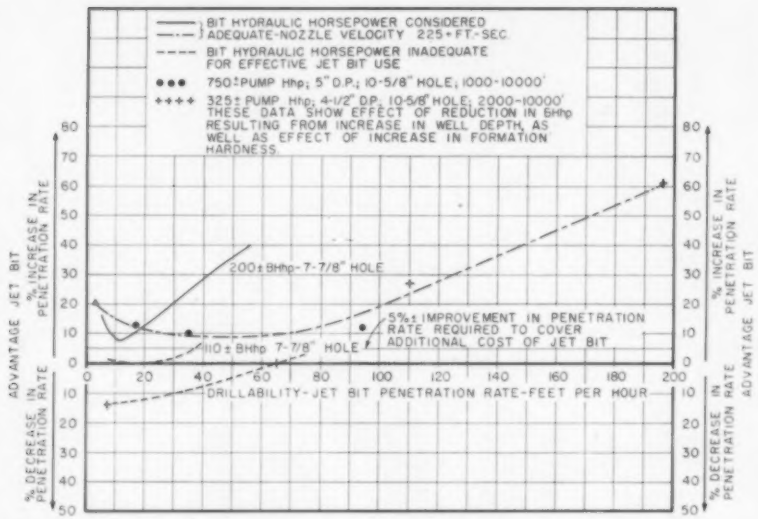
$$\text{B.h.hp.} = \frac{Q \times P}{1{,}714}$$

Where:

B.h.hp. = bit hydraulic horsepower
Q = circulating rate, g.p.m.
P = pressure drop across bit, psi.

and P is proportional to V^2, where V = nozzle fluid velocity, feet per second.

Bit hydraulic horsepower is intended to describe circulating rate and nozzle fluid velocity at the bit, where the actual work is done. However, it can be demonstrated that a respectable bit hydraulic horsepower could be obtained with very high nozzle velocity and very low circulating volume, which would not be conducive to good


BIT HYDRAULIC HORSEPOWER CONSIDERED ADEQUATE-NOZZLE VELOCITY 225+FT.-SEC.
BIT HYDRAULIC HORSEPOWER INADEQUATE FOR EFFECTIVE JET BIT USE
750± PUMP Hhp; 5" D.P.; 10-5/8" HOLE; 1000-10000'
325± PUMP Hhp; 4-1/2" DP. 10-5/8" HOLE; 2000-10000'
THESE DATA SHOW EFFECT OF REDUCTION IN Bhhp RESULTING FROM INCREASE IN WELL DEPTH, AS WELL AS EFFECT OF INCREASE IN FORMATION HARDNESS.
200± Bhhp-7-7/8" HOLE
110± Bhhp 7-7/8" HOLE
5%± IMPROVEMENT IN PENETRATION RATE REQUIRED TO COVER ADDITIONAL COST OF JET BIT
DRILLABILITY-JET BIT PENETRATION RATE-FEET PER HOUR
% INCREASE IN PENETRATION RATE ADVANTAGE JET BIT
% DECREASE IN PENETRATION RATE

"WHICH TYPE OF BIT to use?" This chart can help give the answer. Fig. 18.

bit performance. For this reason, the unit is of little value unless its constituents are also given.

An example of this, as well as an example of optimum utilization of pump horsepower, are demonstrated in Fig. 16. The data are plotted penetration rate vs. bit hydraulic horsepower, and represent the average penetration rates achieved using various nozzle sizes in drilling 7⅞-in. holes to about 5,000 ft. with a pump of about 375 h.hp. Penetration rate was increased by reducing nozzle size from 3 by $\frac{7}{8}$ in. to 3 by ½ in. and thereby utilizing more of the pump horsepower at the bit. (Penetration rate was increased because the improved bottom-hole cleaning permitted the use of more weight on bit.)

Through this section of data, penetration rate varies directly (but not linearly) with bit hydraulic horsepower. However, the use of 3 by ⅜-in. nozzles restricted circulating volume too much for efficient hole cleaning and a reduction in penetration rate resulted, even though bit hydraulic horsepower was increased. For this application, the use at the bit of about 55% of total hydraulic horsepower proved most effective.

Perhaps a better understanding of the many ramifications of hydraulic horsepower can be demonstrated with Fig. 17 (example only). Consider first conventional bits, and start at the origin of the graph. As pump hydraulic horsepower is increased, bit horsepower increases proportionally and from Fig. 15, penetration rate likewise increases linearly with pump hydraulic horsepower. Now, at 200 h.hp., replace the conventional bit with a jet bit. Regardless of the nozzle size used, a reduction in penetration rate results because if a small nozzle is used to produce an effective nozzle velocity, circulating rate is too low for adequate scavaging; conversely, if a large nozzle is used in order to obtain sufficient circulating volume for scavaging, nozzle velocity is too low to clean the cutters.

At 300 h.hp., jet-bit circulating requirements are being approached, and performance commensurate with conventional bits can be obtained provided that a nozzle size is selected to properly balance nozzle velocity with circulating rate. However, if the nozzle selected is too large, nozzle velocity still will be too low to effect cleaning of the cutter and a reduction in penetration rate will result. At 500 h.hp. and above the jet bit performs appreciably better than the conventional bit, and penetration rate is improved with several nozzle sizes. There is again, however, a nozzle size which appropriately proportions nozzle velocity and circulating rate to produce maximum cleaning efficiency, and

TABLE I—PERFORMANCE COMPARISONS FOR VARIOUS TYPES OF BITS—VENTURA FIELD, CALIFORNIA

Area and well— 10⅝ and 9⅞-in. sizes:	Bit type	Reg. (R), jet (J)	Total test interval (ft.)	Footage drilled on test	No. bits	Avg. composite drill. speed* (ft./hr.)	Per cent average	Average drill. wt. (thou. lb.)	Avg. rotary speed (r.p.m.)
T-446	Cross-section	J	2,209-7,363	2,596	10	20.0	..	35	350-400
	Three-cone	J	2,701-7,524	2,729	9	23.7	19	35	350-400
	Cross-section	J	7,705-8,937	588	5	7.64	24	35	350-400
	Three-cone	J	8,166-9,122	292	3	6.17	..	35	350-400
	Three-cone	R	7,524-9,222	757	7	7.18	16	35	350-400
T-438	Cross-section	J	5,888-6,736	562	3	12.0	6	18-22	.....
	Three-cone	J	5,656-6,566	518	3	11.3	..	18-22	.....
	Cross-section	J	7,724-9,143	722	8	6.11	7	18-20	.....
	Three-cone	J	7,644-9,051	688	8	5.69	..	18-20	.....
T-474	Cross-section	J	1,317-5,240	2,557	8	24.6	6	30	250-300
	Three-cone	J	817-5,460	2,086	7	23.1	..	30	250-300
	Cross-section	J	5,611-7,261	676	5	9.45	..	30	200
	Three-cone	J	5,865-7,340	749	5	9.81	4	30	200
T-443	Cross-section	†J	8,132-10,244	955	13	4.78	..	16-24	125-150
	Three-cone	R	8,034-10,197	1,089	12	6.07	27	16-24	125-150
6-in. ± size:									
T-443	Cross-section	R	10,450-11,321	300	5	4.32	..	20	125
	Three-cone	R	10,511-11,235	379	5	5.52	28	20	125
T-801	Cross-section	R	7,441-8,644	292	4	6.15	..	14-16	150-200
	Three-cone	R	7,482-8,578	358	4	7.30	19	14-16	150-200

*Composite drilling speed $= \frac{\text{Footage}}{\text{Rotating hours} + \text{round trip hours} + \text{rig hours, equiv. to bit cost}}$

†Nozzle fluid velocity below 200 ft. per second.

"Increasing pump hydraulic horsepower, thereby increasing bit hydraulic horsepower, permits an increase in weight on bit, which in turn increases penetration rate, with either the conventional or jet bit."

consequently, maximum penetration rate.

Summarizing, it was intended to demonstrate the following:

1. A certain minimum pump hydraulic horsepower is required to produce satisfactory jet-bit performance—this minimum hydraulic horsepower is that required to provide a satisfactory annular rising velocity, and a nozzle velocity of 170 to 225 ft. per second depending on the formation hardness.

2. Increasing pump hydraulic horsepower, thereby increasing bit hydraulic horsepower, permits an increase in weight on bit, which in turn increases penetration rate, with either the conventional or jet bit.

3. For a given pump hydraulic horsepower, there is an optimum utilization in circulating rate and nozzle velocity—this is usually defined as the relationship between total or pump hydraulic horsepower and bit hydraulic horsepower. Although the optimum relationship will vary with pump horsepower, bit size, well depth, and several other factors, the use of 50 to 70% of pump hydraulic horsepower at the bit produces satisfactory results.

Type of bit . . . Type of bit refers to: (1) number and length of teeth; (2) number of cutter elements (two, three, or four-cone); and (3) circulation pattern (jet or regular bit). Selection of tooth style depends primarily on the type of formation to be penetrated, and a general discussion here would be of little value. Likewise, there is little point in discussing number of cutter elements, inasmuch as general field acceptance has shown the three-cone to be the best over-all choice. Therefore, this discussion will be concerned primarily with the relative merits of jet and regular bits.

In Fig. 18 there are plotted several comparisons of jet and regular-bit performance in various formations.[20] The graph is constructed to show the improvement in penetration rate achieved with the jet bit over regular bits, in formations that drilled at various rates. The jet-bit drilling rate is used as the unit of formation hardness. From these few comparisons, it appears that: (1) jet bits perform appreciably better than regular bits in very hard formations; (2) little advantage is obtained with jet bits in the medium-hard formations; and (3) the jet bit's advantage increases with softness of formation from medium hard to the very soft. When footage cost is considered instead of penetration rate, the advantage of the jet bit is reduced slightly throughout the range of hardness because of the 15% additional cost of the bit, and the advantage through the medium-hard range becomes very small.

One reason for a varying minimum nozzle velocity is evident in these data. With bit hydraulic horsepower in the order of 200, which would provide 225± ft. per second nozzle velocities for the conditions represented in Fig. 18, jet-bit performance varies with formation hardness but is always better than regular-bit performance. However, with 100 b.h.hp., the jet bit performs better only in the soft formations, and then only slightly better. Thus, some improvement with jet bits can be achieved in soft formations (where a large improvement is possible) with relatively inefficient operations provided by low nozzle velocities. However, the most efficient jet-bit operation (high nozzle velocities) is required to obtain an advantage in medium-hard formations where the advantage of the jet bit is small at best.

The relative performance of jet and regular bits also seems to depend on the number of cutting elements on the bit. Referring to Table 1, where performance of various types of bits is compared, there appears to have been little difference in performance between the cross-section jet, three-cone jet, and three-cone regular bit in these particular formations. However, three-cone regular bits in the two examples given performed 19 to 28% better than cross-section regular bits. This suggests that the cross-section regular might be inferior to three-cone regular bits, and consequently to all types of jet bits, probably because there are more obstructions between the fluid stream and the bottom of the hole than in the three-cone bit.

Here's How to Determine Optimum Drilling Techniques

Determining optimum drilling techniques includes determining the combination of weight on bit, rotary speed, and hydraulic horsepower which results in minimum drilling cost for a certain formation. The use of jet bits is presumed to be a foregone conclusion, inasmuch as their performance is not worse than a conventional bit, although sometimes not much better. General rules for selection of bit-tooth type cannot be given because of the major influence of formation. And it is presumed that on-the-spot selection is adequate. Type of circulating fluid is not included for the same reason.

In practice, the determination of optimum drilling techniques actually consists of three problems:

1. To determine the best weight and rotary speed practices for the equipment in use.

2. To determine the equipment (pump), and weight and rotary-speed practices required to achieve minimum footage cost.

3. Determine best weight and rotary-speed practices for any intermediate equipment. It appears that these three problems can be solved reasonably well with a very small amount of field testing, by combining the several relationships which have been developed here, as in Fig. 19.

Fig. 19 consists of a chart comprised of the relationship between: (1) penetration rate and weight on bit; (2) penetration rate and hydraulic horsepower; (3) penetration rate and optimum weight on bit; and (4) the relationship between optimum rotary speed and weight on bit. The function of the chart can best be explained with a simplified example.

Assume that a certain rig is available to drill a 1,000-ft. homogeneous shale section, and it is desirable to determine optimum techniques with the available rig and the equipment required to most economically drill the shale section. The initial conditions are as follows:

1. 400-h.hp. pump.
2. 4½-in. drill pipe.
3. 9⅞-in. hole.
4. 3 by ½-in. bit nozzles.

When the shale section is drilled, short-duration tests of weight vs. penetration rate are made to: (1) establish a drillability index for the formation and (2) to determine at what weight the bit begins to ball up with the pump available (a tentative index must first be established to select an appropriate rotary speed). These test values are plotted on the weight vs. penetration-rate chart (upper right-hand section) and an appropriate curve drawn through them. The low-weight section of this curve should be linear until the bit begins to ball up. From the point on this curve where the bit begins to ball up, a horizontal line is drawn left to intersection with 400

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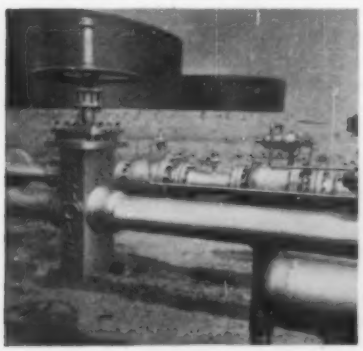

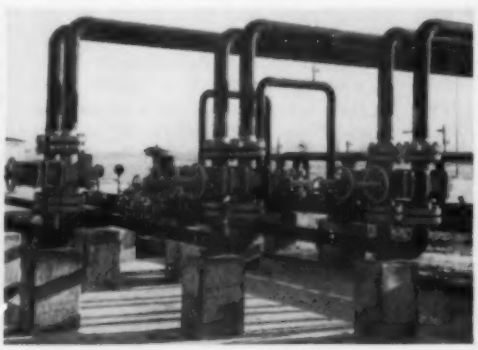

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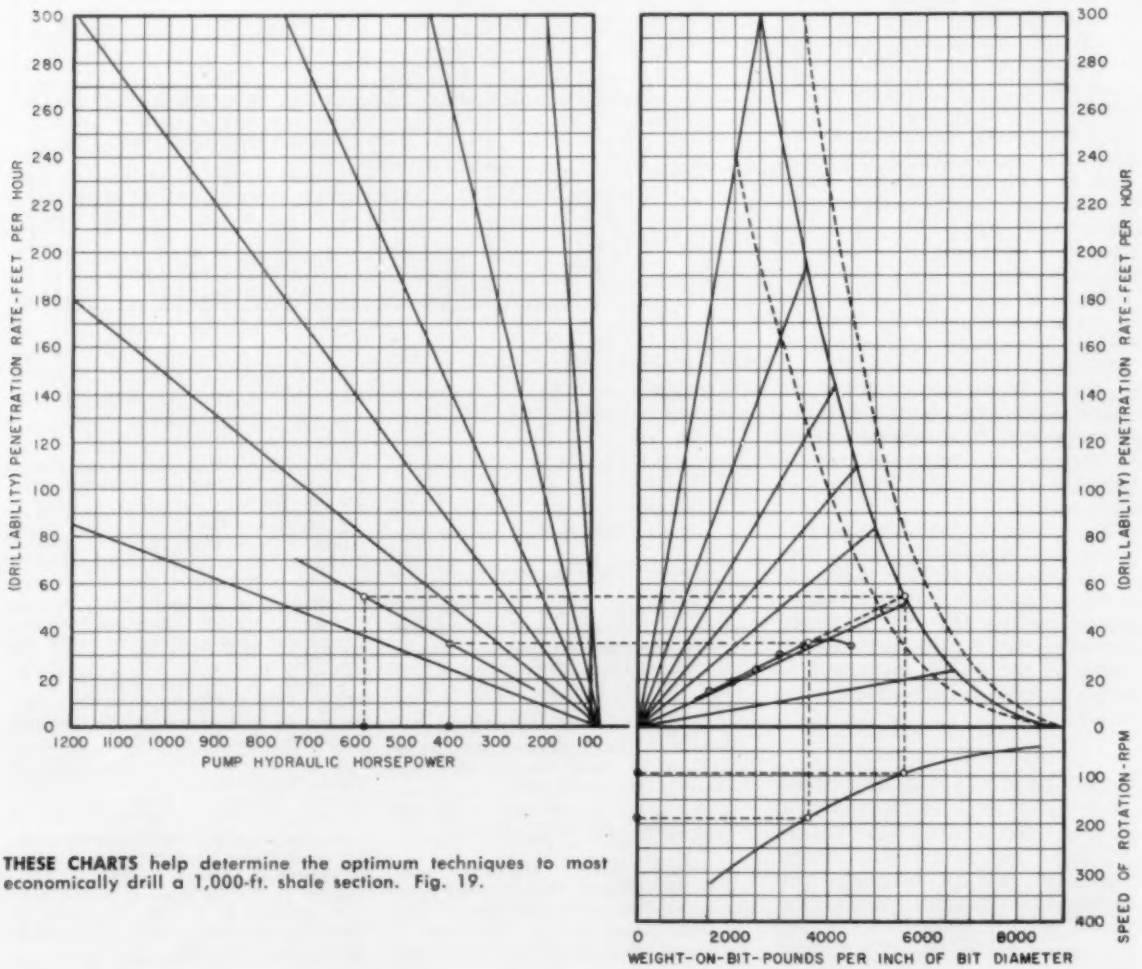
"Using whatever rig is available, several weight vs. penetration-rate tests are made in each of the three major formations penetrated in order to establish the appropriate indexes . . . Care must be exercised to insure that the balling-up weight is clearly demonstrated in each test."

h.hp. This single point is sufficient to draw the linear relationship between hydraulic horsepower and penetration rate for this shale section.

It will be noticed that this index is in a sense dimensionless, inasmuch as it includes hole size, type of bit, drill-pipe size, etc. Also from the weight where the bit begins to ball up, a vertical line is drawn downward to intersect with the optimum rate of revolution curve. Thus, from these manipulations, this formation would be most economically drilled with a weight of 3,600 lb. per inch of bit diameter (35,000 lb.) and 190-r.p.m. rotary speed, with the 400-h.hp. pump available.

Now return to the weight vs. penetration-rate index and extend the linear section of the curve to intersect the optimum weight on bit curve. From this point a horizontal line is drawn left to intersect the hydraulic-horsepower index curve already established for this formation. This intersection gives the hydraulic horsepower required to maintain sufficient bottom-hole cleaning to permit use of optimum weight. A vertical line is also drawn downward to determine optimum speed of rotation for the new weight. These manipulations show that minimum footage cost could be achieved in this formation with a 580-h.hp. pump, used in conjunction with a weight of 5,600 lb. per inch of bit diameter (55,000 lb.) and 95 r.p.m. By working backwards from the hydraulic-horsepower index curve, the best weight and rotary-speed practices for any hydraulic horsepower can also be determined in the same way.

This was purposely made a simplified example including only a homogeneous shale section; to determine optimum drilling techniques for a field would involve more formations, usually two to four. Therefore, it would be necessary to make weight vs. penetration-rate tests in each of the principal formations penetrated and treat each formation separately as a problem. Obviously, instantaneous penetration rate will vary appreciably over these large depth intervals. However, this does not affect use of the chart appreciably because it is impractical to vary weight rapidly and continuously while drilling and because the chart was constructed from averaged field data. The primary precaution that must be taken is that the results from the field tests are representative of



THESE CHARTS help determine the optimum techniques to most economically drill a 1,000-ft. shale section. Fig. 19.

average penetration rates throughout the interval.

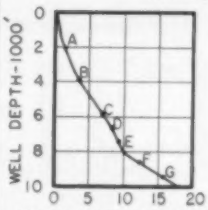
Fig. 20 gives an example of the function of the chart for this purpose. Using whatever rig is available, several weight vs. penetration-rate tests are made in each of the three major formations penetrated in order to establish the appropriate indexes (an appropriate rotary speed is estimated for each test series). Care must be exercised to insure that the balling-up weight is clearly demonstrated in each test. From the results of each of these tests, optimum techniques are predicted for the desired conditions (400 and 500-h.hp. pumps, and optimum pump), as in the single example above. For the two conditions of known hydraulic horsepower, a work sheet giving weight and rotary-speed practices to achieve minimum cost can now be prepared.

For selecting the optimum pump size a compromise between the various optimum pump hydraulic horsepower indicated must be made, placing emphasis on that section of the hole which will require most drilling time. For this example, 650-h.hp. well covers maximum pump requirements except for one short interval, which can be ignored. After establishing the pump which is to be obtained, weight and rotary-speed practices are reevaluated and a work sheet prepared similar to the one mentioned previously.

All of these techniques are related to the original conditions; 9⅞-in. hole, 4½-in. drill pipe, 3 by ½-in. bit nozzles. Transformation to different conditions requires some estimating. A change in size of drill string could be made by computing the hydraulic horsepower necessary to provide equal circulating rates and nozzle fluid velocities (assuming rising velocity adequate under both conditions). Transformation to various hole sizes would be less accurate, and probably should be made on the basis of hole diameters squared.

The previously described procedure is intended only to assist in arriving at near-optimum drilling techniques in the shortest possible time. It is again pointed out that this chart is, as yet, very tentative, and it would be advisable in any case to continue field testing in order to refine drilling techniques.

PROBLEM: DETERMINE OPTIMUM DRILLING TECHNIQUES FOR AVAILABLE RIG AND RIG EQUIPPED WITH 500 Hhp PUMP, AND DETERMINE PUMP CAPACITY REQUIRED AND OPTIMUM DRILLING TECHNIQUES FOR NEW RIG, THAT RESULT IN MINIMUM COST. AVAILABLE RIG EQUIPPED WITH 400 Hhp PUMP.



DRILLING PROGRESS CURVE FOR FIELD (USED TO DETERMINE HOW MANY BASIC FORMATIONS PENETRATED)

INITIAL WELL DRILLED AS FOLLOWS:
1. 9-7/8" HOLE
2. 4-1/2" DRILL PIPE
3. 400 HYDRAULIC HORSE POWER PUMP
4. JET BITS - 3X1/2" NOZZLES

INFORMATION DESIRED
1. OPTIMUM WEIGHT AND ROTARY SPEED PRACTICES FOR 400 Hhp PUMP (RIG USED FOR TEST)
2. OPTIMUM WEIGHT AND ROTARY SPEED PRACTICES FOR 500 Hhp PUMP (SECOND RIG TO BE MOVED INTO FIELD)
3. EQUIPMENT AND TECHNIQUES REQUIRED TO ACHIEVE MINIMUM COST.

TEST INFORMATION

TESTS	A	B	C	D	E	F	G
WEIGHTS	PENETRATION RATE - FT./HR.						
1000 PIBD	93	22	15	16	13	5	3
2000	188	45	25	35	23	8	5
3000	203	55	40	50	36	10	6
4000		40	40	55	47	15	8
5000			35	47	47	12	9
6000							6

INFORMATION FROM CHART, FIGURE 19

TESTS	A	B	C	D	E	F	G
OPT. TECH. 400 Hhp							
WT-PIBD	2000	2500	3000	3200	4000	4000	4500
RPM	290	255	225	210	165	165	140
OPT. TECH-500 Hhp							
WT-PIBD	2600	3200	3950	4300	5200	5300	5700
RPM	250	210	170	150	110	105	90
OPT. TECH							
Hhp *	525	700	650	575	525	600	600
WT-PIBD	2800	4750	5300	5000	5400	6800	7200
RPM	235	130	105	120	100	70	55

* 650 Hhp PUMP SELECTED FOR NEW RIG

AN EXAMPLE shows how to find the optimum drilling techniques and the minimum cost in a given field. Fig. 20.

Acknowledgment

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THE PANEL

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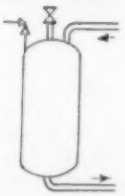
CHANGING CATALYST MAKEUP



CHANGING CATALYST MAKEUP: What difficulties, if any, have been encountered when the type of makeup catalyst has been changed —say changed from synthetic to natural or vice versa—in fluid units?

EPPARD: At our West Tulsa refinery, they recently changed from natural catalyst to the synthetic catalyst by making their normal catalyst addition synthetic, rather than the natural. They converted over and apparently had no difficulty whatsoever in making this change.

McMAHAN: On those fluid units which are being pushed to maximum capacity—and most of them are—there have been cases when catalyst changes resulted in excessive catalyst losses, and this has been explained in the several instances that we know of by the fact that catalyst densities were changed quite markedly in the units without the operating personnel being aware of this and catalyst losses were the result.

WALK: Is that more prevalent, switching from one way to the other, or are you liable to run into it either way?

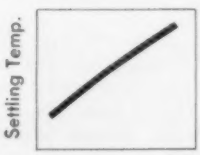
McMAHAN: I don't think there is any rhyme or reason as to the manner in which the switch was made. Actually we know of one case where this occurred in simply going from two grades of synthetic.

DANIEL: (Standard Oil Co. of Ohio) The comment was made by Charlie McMahan about having troubles with catalyst of different densities, and I think one of the situations he was thinking of was ours. We have had trouble with both high and low alumina catalysts when the density of the equilibrium catalyst had gotten too low.

I might mention the background a little better as to how our density got so low. We had to try to get maximum activity to get throughput, and in doing this we have withdrawn a little catalyst and added extra makeup. We have also emphasized keeping our regenerator temperatures down to a dense bed maximum of about 1,125° F. In effect, we've been babying the catalyst and a low density high activity equilibrium catalyst resulted. With regenerator velocities of about 2 ft. a second we have to maintain an equilibrium catalyst apparent bulk density of about 0.72 or higher, in order to physically hold catalyst in the unit.

This also ties in a little with the problem of sintering which was mentioned before. At one time we went a little too far in the direction of using heavy catalyst to try to get our losses down and we found that in that case we definitely promoted the sintering. We got up to sintering indexes by the UOP method of analysis as high as 25, which is pretty poor catalyst, and that was with fresh catalyst of an apparent bulk density of about 0.50.

SLURRY GRAVITY



SLURRY GRAVITY: What is gravity of bottoms from fractionating column on fluid cat unit?

REYNOLDS: Evidently, there is a little more behind that question than just seeking a gravity number. In the case of our unit where we actually

recycle the fractionator column bottom into the reactor at an equal rate to the fresh feed rate, we have found that running gravities of 15° or 16° API gives us the most optimum relation between coke laydown and conversion to liquefied gasoline. Higher gravities result in less coke laydown and also less conversion.

JONES: On our clarified slurry, we run about 16° API gravity. Our cat unit operates in the neighborhood of 63-64% conversion on fresh feed with a 1.4 recycle ratio. In our case, we are recycling a heavy cycle fraction, which will run about 26° API gravity.

EPPARD: We have noticed on our unit that the split between the heavy cycle oil and slurry depends on how hard you strip the bottom of the tower. Also, at constant conditions as the conversion increases, the gravity will go down. We do not have a correlation, but examination of the data indicates you could get a good correlation.

ANDERSON: We have had gravities all the way from 8.5 up to 23.8, depending upon the particular conditions the unit is operating. I am not sure whether they intended to include the amount of catalyst in the slurry or not. But, if you weigh it with the catalyst it will be heavier than if you decant it and so forth, the gravity will change any place from 1 to 3 API numbers, depending on whether you are weighing catalyst or not. Slurry gravity to a large extent is a function of how much light or heavy oil you are pulling off your fractionator, and such things as that.

WALK: I can see from these answers that gravity may very well cover the full range. If we haven't answered the specific question that someone had, perhaps they could clarify the question a little bit more to get some specific point that they'd like to bring out.

STARK: (Ohio Oil Co.) We are, at present, running our cat cracker at about 73.5% conversion on the 28-gravity gas-oil feed. It's a combined atmospheric, vacuum and coker gas oil. We have lowered our bottoms gravity down to approximately 8° API and we think we have room to go ahead and increase conversion which, in turn, will lower the gravity, as Mr. Eppard explained. We would like to know if anyone has run gravities as low as 4° or 5° API and if so, has any kind of mechanical trouble as far as coking in the bottom

"Higher gravities . . . less coke laydown."

of the tower or anything like that occurred.

WALK: Thank you. Perhaps that does define the problem a little bit closer. In other words, we would like to know if anybody has run below 8 on the bottoms without any trouble.

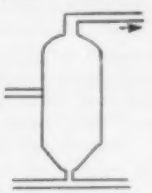
HAIG: We have run at least one unit below 0° API, and I don't know of any coking problems in that case. When you get that low on gravity you have a very aromatic stock and it's pretty refractory, so I think at the same temperature you would probably have a little less tendency to crack.

COMMENT: At one time we reduced our fractionator bottoms gravity and actually we wanted to see where was the lowest point we could go with it and we took it down to zero gravity. Now that's the extreme, but the resulting problems were that in our unit we generate steam with the fractionator bottoms and we coked solid the steam regenerator with a zero gravity bottom.

CURRIN: (Atlantic Refining Co.) We run our heavy cycle stock to extinction and our slurry settler and clarified oil gravities have run in a range of 5 to 10 and operated quite satisfactorily. We try to minimize this slurry bottoms which goes back to the reactor and we would like to ask whether anyone has found a way of concentrating the catalyst even more than you get in a normal Dorr thickener type of slurry settler in order to remove the last 200 to 300 bbl. of slurry oil and still get the catalyst back into the system.

COMMENT: On this slurry deal, on our No. 2 cat cracker which is a coker charge and slop, we run a zero to negative to gravity all the time and never have any trouble.

SLURRY HANDLING



SLURRY HANDLING: Do you have any trouble getting the slurry out of the bottom of the decanter?

CURRIN: No, that's not the problem. We would if we tried to cut the underflow any lower. We are down in the neighborhood of 250 to 350 bbl. a day and as you know, every barrel of this material backs out several barrels of feed. But, since we are at coke-burning limit on our unit, we are interested in techniques that may help us reduce that flow still further and gain a little more feed capacity.

COMMENT: (Park of Pure Oil) Somebody in our outfit dreamed up a gimmick to do just that. It never was installed. However, if we ever do get into a position where we need to get rid of, or at least concentrate even further, this slurry or try to get out any more coke burning perhaps it will be installed. But, the idea was in the decanting section of the fractionator to place a small circular ring. The bottom of this ring has little holes cut so that you could flow into the very cone of the decanter just a small quantity of fairly cold heavy gas oil which you expected to recycle in any case.

In other words, we are recycling heavy gas oil to extinction and in that means we expect to produce more decanted oil, so to speak, and recycle less of it and as a result burn less coke. But so far, as I say, we haven't been pushed to do that, and, as a result we haven't put it in. In fact, it's still pretty much in the gimmick stage.

ADAMS: (D-X Sunray) We do exactly that at West Tulsa. We have a heavy cycle ring in the settling section of the decanted oil settler and we can introduce more heavy cycle into the settler than we draw concentrated slurry oil for return. Just how effective the replacement is, we don't have any concrete data.

EPPARD: The slurry from the bottom of the slurry settler is put into the reactors above the catalyst level. The idea being, that in the vapor phase the catalyst will drop back into the bed and the oil will go on overhead without contacting the catalyst. We do not have any data as to how much good this system does.

ANDERSON: We didn't have this particular problem, but we had another problem that was helped solved by the same mechanism. We had 50% catalyst in our fractionator bottoms which made it pretty difficult to handle after you have decanted it a lit-

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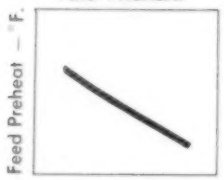
tle more, and we did essentially what these other fellows did, just bring heavy recycle in to dilute the slurry and pick it up. It seems that it would work in your particular situation too.

CURRIN: Mr. Eppard's solution of returning the slurry above the cat bed was one that we liked, but, we were a little worried about the coking problem. Can you tell me whether you had any particular trick of injecting it so that you wouldn't coke up your nozzles and get into further problems?

EPPARD: We put an "ell" pointing down on the inlet line and have not had any trouble with coking. We had a line going straight into the reactor without any deflector and we did get some coke buildup where the oil sprayed against the cyclones.

FEED PREHEAT



FEED PREHEAT: Please report on success in using feed preheat to reduce coke laydown in fluid cracking units.

JONES: As an initial phase of continuing studies to determine if we could increase the fresh feed capacity of our cat cracking unit, we made a test run in which we increased the combined feed temperature from its normal (then about 340°) up to about 480° F., simply by bringing hot coker gas oil directly to the cat unit (without going into intermediate storage). We had very successful results. We reduced the coke make on fresh feed from about 7.7 wt. % down to about 6.6 wt. % at the same fresh feed rate and at the same conversion level. Incidentally, we have a heat balance UOP unit, and one of the gratifying things to us was the fact that there was no rise or any perceptible change in the regenerator dense phase temperature. We have continued to utilize this particular technique to maintain 480° to 500° F., on our combined feed temperature, and we have been able to increase our fresh feed rate at a given conversion level by 500 to 600 bbl. a day.

KILLEN: About all I can say is about what Bruce Jones has said. Our experiences have been very similar. We

"... any particular trick of injecting?"

raised our temperature from about 250° to 400° with a feed preheater and we got about a 10% reduction in coke laydown, which worked out to be just equal to the furnace duty. Again as they found we didn't have any change in regeneration temperatures.

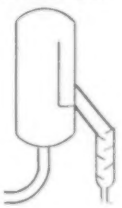
The regenerator temperature seemed to remain constant whether we went up or down in feed preheat temperature. This 10% coke was on a rather light feed. We think it would have been even more so on a heavier feed and we also believe from other experiences than our own, that the further we can go in this feed preheat the better reduction we're going to get. We just haven't been able to see a stopping point yet.

EPPARD: We have some data on the higher range feed preheat. We had one furnace on our unit and we were able to preheat the feed to about 500° F. We built another furnace which allowed us to go on up to about 700° F. We got some data on the unit with the 550° F. preheat and then immediately after we put the second furnace on we went up to about a 660° preheat. With these two cases, it was found that at the same coke laydown, we got about 1% more conversion.

That is, at the 550° preheat we had about 61% conversion and 6 wt. % coke. Then with 6 wt. % coke yield and the 660° preheat we obtained 62% conversion, a 1% increase. The cat-oil ratio with the 550° F. preheat was in the neighborhood of 8 to 9, and when we increased the preheat it dropped down to 6 to 7 range, at constant conversion. This reduced coke yield at constant conversion is supposed to be the effect of lowering the cat-oil ratio but it occurs to me that by letting the regenerator run at a higher temperature you could reduce this cat-oil ratio and thus reduce the coke yield with regenerated temperature rather than using feed preheat.

HAIG: I agree with Jack Eppard's last statement. We've never been able to find any reduction in coke make other than what is attributed to the lower catalyst circulation rate. If you have a poor stripper so that you have a lot of strippable carbon vapors coming over with the catalyst, you could have a much larger apparent reduction. As far as we've been able to tell, the only effect of raising the feed preheat is that which we would associate with the reduction in catalyst circulation rate and the actual adsorption of polymers on the catalyst.

OIL AND COKE ON CATALYST



OIL AND COKE ON CATALYST: Does anyone have any data on how much of the catalyst deposit is actually hydrocarbon oil that stayed on the catalyst and not stripped, and how much of it is coke from the cracking reaction?

HAIG: As a very general statement, I think the only way we can get a guess out of it is your hydrogen-to-carbon ratio as burned in the regenerator. The hard coke actually deposited on the catalyst I think you will find about 4 wt. % hydrogen. For vapors coming over, it may be in the order of 20% hydrogen. By making a material balance on the regenerator and finding your hydrogen-to-carbon ratio, you can get some idea whether your stripping is poor.

ANDERSON: I was just checking some figures here on one of our daily operating summaries and it looks like it was 85 or 90% carbon burned per hour, and the balance would be hydrocarbon.

REYNOLDS: I would like to get back to a point that Jack Eppard made. In our experiments, about the same temperature range that he had, we found that we were unable to reduce the coke laydown and that the heat we put in the preheater moved over into the regenerator bed. In analyzing the thing it always seems to come back to this cat-to-oil ratio and apparently that's not a linear function, it must have flat places in it.

There are other ways of changing your cat-to-oil ratio, and they don't result in a reduced coke laydown. So, we are beginning to wonder what the true effect is in this preheat problem. I don't really feel like it's all in the cat-to-oil ratio. It probably goes back to stripping, but, I've never found

anyone that has any real data that would help the situation.

JONES: In connection with this problem, I should have reported that we feel improved stripping was one of the primary factors causing decrease in coke. The weight per cent of hydrogen in coke was reduced from 12.5 down to about 11%. We thought that this was indicative of improved stripping on our cat unit, resulting from lowered cat-oil ratio.

EPPARD: We are talking about the cat-oil ratio, and Ben Hartman may be able to give us some data. In my limited experience and looking at different cat cracking types, I have noticed that the TCC moving-bed units run a very low cat-to-oil ratio and are supposed to make less coke at the same conditions than a fluid unit. Is this due to the lower cat-to-oil ratio?

HARTMAN: I don't know whether I ought to try to answer that or not. It probably is somewhat controversial, but certainly it has been our impression that by reason of operating at very low cat-to-oil ratios, something in the order of 2 to 1, the problem of stripping is certainly minimized.

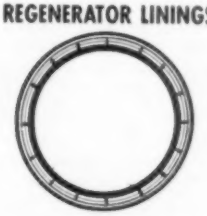
CURRIN: I might just add that we agree with the observations made here that stripping seems to be the most important item. We've done everything we could to improve stripping and we seem to be running in the range of 8 to 10% hydrogen on coke. Even at that level, we've been able to justify keeping our preheat up around 700°.

MAXIMUM PREHEAT: I realize that there's probably a lot of ramifications, but does anyone have what they consider to be an ultimate maximum on preheat?

COMMENT: Might be where you start to thermally crack.

WALK: Anyone have a number on maximum preheat? It might be reactor temperature.

REGENERATOR LININGS



REGENERATOR LININGS: What has been the experience of this group in the repair of regenerator linings in fluid units?

REYNOLDS: I can give a description of the type of lining that we have. I might open by saying that it is about 4 years old and it is composed of a light refractory, trade name Varilite, to about 2½ in. thick against the shell of the regenerator. Then there is a layer of hex steel on the outside of that held to the shell with Nelson studs and then it is hard surfaced with 1½ in. of Petrolite, Petromix Corp. dense refractory. This type of lining seems to be subject to some excessive cracking and buckling away from the regenerator wall. However, I think we are receiving a satisfactory life out of it and it is fairly easily patched and maintained and patching is very effective.

ANDERSON: One unit in particular —this is a wartime UOP unit—installed in 1944 with a layer of insulation and then cast tile pieces, a regular fire-brick-type lining. It operated during the war period, shut down for several years, and has been operating since 1949. We have had practically no maintenance work on that particular lining. Although it is quite a bit more expensive than a castable-type lining, it will really hold up.

BYRNE: We have two units, too, one of which is a war unit, and our experience with the wartime unit would be similar to Mr. Anderson's. We have had some maintenance in the lining, which is a Haydite Lumnite castable insulation next to the steel with the refractory tile hung on hangers on the outside. There has been some replacement in this lining but we still consider that type the most satisfactory and we are continuing to use it, and maintain it.

On our No. 2 unit which was built much later, about 1951, the lining is monolithic. Next to the shell we use A. P. Green, SK-7. For the outer refractory material, we are using two types, both by General Refractories. One of those is Basicrete and the other is Light Cast 50. Those materials have been satisfactory. However, they are supported on hex steel and we have had failure of the hex steel due to oxidation. We have gone to 11-13 chrome hex steel and that seems to pretty well solve that problem.

McMAHAN: Of course, proper installation to begin with is vitally important here and as a matter of interest it is considered that 5 years for a lining might be a reasonable sort of number. Those getting under 5 years feel that something may have gone wrong and those getting over 5 years feel that you are getting pretty good life out of the lining. Unit shutdowns and startups have an effect upon lining. Many shutdowns and startups, of course, adversely effecting life. Widely varying temperature ranges in the regenerator have an effect.

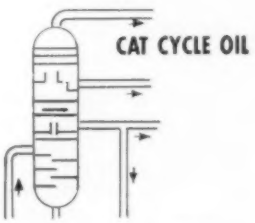
"... the liner is monolithic."

THORNTON: (Lion Oil Co.) I would like to direct my question to Mr. Byrne. Have you experienced any expansion problem with this 11 to 13% chrome hex steel, causing it to buckle away from fasteners on the regenerator shell?

BYRNE: I don't believe we have.

COMMENT: I was talking to some people who had some very interesting experience in transfer lines. After they had their erosion - resistance coating down, they went ahead and painted it with a sodium silicate solution. What they ended up with was a very slick internal hard surface. Instead of their catalyst digging in, it would just kind of slide along on it and they were having tremendous success with this solution on top of their final lining.

(See also article by J. S. Clarke, The Oil and Gas Journal, August 13, 1956, page 118.)



CAT CYCLE OIL: What reactor conditions affect the cetane index of catalytic light-cycle oil? How much improvement can be obtained by the hydrogenation of catalytic light-cycle oil?

ANDERSON: We found that any move that tends to increase the conversion level of your cat cracker will tend to decrease the cetane number of the light-cycle oil. We have had cases going up in the order of 88% conversion where cetane numbers get down in the low twenties. Where back

around 65% conversion they may be any place from 33% to 39%.

We have limited knowledge on hydrogenation of catalytic light-cycle oils. We have a Unifiner at our plant and so far we have made one run on just straight cycle oil and on that particular run we only increased the cetane number two numbers, at the most. We weren't up to the maximum severity on the Unifiner operation. I think it could probably be increased 4 or 5 numbers fairly easily.

WOMELDORPH: I pretty much agree with what John Anderson said about any move that raises your conversion level will tend to decrease your cetane index. We found this to be true, regardless of how you increase the conversion level. Whether it's temperature, pressure, or other variables which increase the severity, the cetane index definitely decreases with greater cracking severity.

Another point though is that the amount of virgin gas oil that finds its way down into the diesel cut will have a somewhat marked effect on the quality that you get there. As far as the hydrogenation is concerned, we've done some work on this type of material and we find, of course, it's a function of how deeply you hydrogenate the compound you are converting. I think that may be the reason that you only obtained the one or two-number increase.

HARTMAN: I can agree with the previous comments with regard to the process variables which reflect on cetane index. We have some actual commercial experience on hydrogenation and we're getting an increase of two to three cetane numbers.

COMMENT: This comment is not directly with regard to hydrogenation, but with quality improvement. Another route toward quality improvement toward that type of material is through extraction. We recently completed an SO_2 extraction unit to perform exactly that job—so hydrogenation isn't the only route.

LIGHT VIRGIN GAS-OIL FEED: Does anyone have any operating experience on catalytically cracking light virgin gas oils? In other words, something in the 650° F. e.p. range?

JONES: We have cracked certain portions of that in our total feed. In other words, occasionally we find it desirable or necessary to put so-called SR diesel fuel in our over-all gas oil feed. It represents a pretty small quantity. But, we can definitely tell the differences in our operations. It obviously is much harder to crack than heavier boiling gas oil fractions from East Texas crude oil. We have no definite or specific information, other than we know that we have to definitely increase the severity in order to do the same job of cracking.

"... Hydrogenation isn't the only route."

PARK: (Pure Oil Co.) Some time ago we sent through a pretty extensive program in taking various possible stocks throughout the entire plant determining the expected yield of products from cracking all these stocks. They included some of the wider stocks, such as you said, 650° F. range. I don't have data immediately available to me, but, I am sure that Cities Service also published a paper along this same line. (See article by E. C. Oden and J. J. Perry in The Oil and Gas Journal, March 22, 1954, page 164.) I am sure that they included some fairly light stocks in their similar investigation. They gave yield data also. We have never published a paper on the subject, but if anyone wants it I am sure we could give it to them.

CURRIN: I might just mention that on one or two occasions we have put some light material of this nature in our feed, either because it was something off spec that we wanted to run, or for some other reason. We found that it knocks your octane considerably. You can easily lose four or five octane numbers on your cat naphtha.

WALK: In other words, that would be tied in with a higher naphtha content of a lighter stock and would be in line with the expected drop in octane.

CURRIN: Yes.

DANIEL: (Standard Oil Co. of Ohio) I might just add something along the lines of what Marvin Park said. We compared the different boiling range feed stocks in our pilot plant, and the light virgin gas oil will run about 30 to 35% lower conversion than a heavier gas oil, say of around 650-675 midboiling point. That's with the same cracking severity in terms of temperature, activity and so forth on each stock, with the exception of recycling on the heavier stocks somewhat in the same ratio as is done on the commercial units. But, it's based on once-through operation on the light gas oil which is again what you'd get into commercially. The distillate octane was slightly higher with the light gas-oil feed.

HAIG: On this light gas oil, a comment was made about going down in octane. I think that's largely due, as someone said, to the inclusion of virgin naphtha in the cut. In a well-stripped heating-oil cut, I think you'd expect a higher octane number at the same conversion, than you would with heavy gas oil. In fact, some data I happen to have here on one light gas oil in the heating-oil range came out with a 99 clear research octane at about 60% conversion. I don't think you can expect to do that with a higher boiling cut.

McMAHAN: Generally speaking, if the refiner is so pressed for gasoline production that he has to crack virgin diesel oil it is certainly preferable to do that in a thermal unit from a dollar standpoint if thermal-cracking capacity is available, in preference to including virgin diesel into cat-cracking feed.

WALK: The difference in octane with higher yield would probably balance it.

NATURAL CATALYST

	Syn.	Nat
Conversion	—	—
Gas	—	—
C_3	—	—
C_4	—	—
C_5	—	—
O.N. Clear	—	—

NATURAL CATALYST: What has been the cat-cracking experience on Filtrol 100 and 110 catalyst in regard to product yields, cat distillate octane, catalyst usage, and operability?

COLTHURST: (American Petrofina) Your question about switching from synthetic catalyst to Grade 100 or 110. We have a TCC unit—we had used synthetic beads and then switched to Grade 110 last February. Our catalyst usage has decreased and also since the Grade 110 is cheaper than the bead catalyst, our catalyst cost has decreased about 50%. As with most refiners, our cat cracker is running at maximum throughput all the time and we do not enjoy the same conversion level that we did 2 years ago.

However, at the reduced conversion level that we are operating, which

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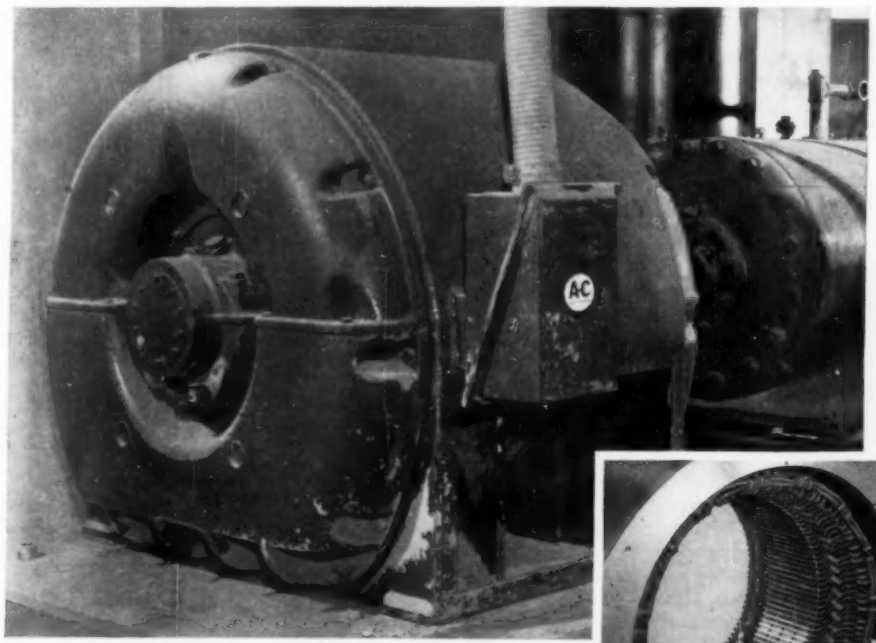

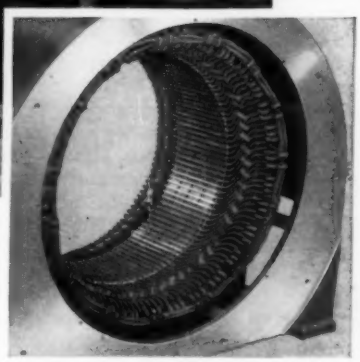

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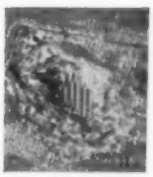
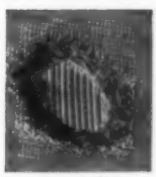


Polyester Mica Tape



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has been enforced by maximum throughput, there has been no decrease in volume of gasoline. So, as far as we are concerned, gasoline production has remained the same. Quality is at least as good, perhaps three-tenths of an octane better, but, of course, that increase is hard to establish definitely.

I would agree with the other comments that if you include light materials in your cracker feed you are going to suffer. By running a blocked operation and increasing cracking conditions—going up to 930° to 940° F. reactor outlet temperature, we have processed light cycle oil.

Conversion is very poor, but, you do get a yield of gasoline in the neighborhood of 25%. The octane of this material is very good, in excess of 99.5. The yield of light cycle oil from this operation is about 50%. It's a satisfactory operation if you have the capacity to run blocked out.

WALK: Do you make any heavy-cycle oil?

COLTHURST: In our TCC unit the heavy-cycle oil is the recycle to the reactor, and is not a product. Again we are running for maximum light cycle throughput. We don't run the light cycle until our storage is full, so during that operation we are interested in maximizing the so-called "virgin" light cycle throughput. In order to do that we minimize the recycle to as small a quantity as possible which is responsible for the high yield of light cycle oil.

The other heavy product from the operation is syn-tower bottoms, and it does increase percentagewise a small amount. From our normal virgin gas-oil stock, which is about 26° API, we would expect a 3 to 5% syn-tower bottoms yield. That is, by the way, a minus 4° to 0° API material. Very heavy. We don't have any trouble with it in the steam generator.

When we run the light-cycle oil, the syn-tower bottoms yield may go up to about 6½%. It is also a heavy material—about 0° API, or it might be a little lighter, plus one or plus two. The coke yield on light-cycle oil is higher. Naturally, pressure minimizes the amount of total feed we can put in, and coke load the amount of recycle.

Running with the minimum recycle, which we do in order to maximize the feed, the coke is not a problem when we crack light cycle. Coke make increased about 8 to 10% over a normal gas-oil operation. The light-cycle oil we charge has a 440° F. i.b.p. to 670° e.p.

"It still costs to hydrogen treat it."

WOODSIDE: (Bell Oil & Gas) I have two phases I want to go back over. I want to go over this light gas oil. We started up our UOP cat cracker and our vacuum unit wasn't on stream. Our charge consisted of about 700° F. end point straightrun material. That has been some 4 years ago and the numbers have faded from my mind. We have a complete file on the analysis and all of the characteristics of the products.

I would be glad to furnish that to anybody that would contact me. Our charge at the present time is 33%, 700° F. e.p. straightrun gas oil. Octanewise, we have had no ill effects. I think the octane on our cat-gasoline stream compares with any other unit of the same type. I would also like to go back to this improvement in the stripping from the preheat. If you preheat your stream, do you reduce your catalyst ratio in a UOP unit? We have a figure that you get 80% cracking in the riser. Therefore, this must be reduced if you reduce the amount of catalyst to oil.

To maintain the same conversion you have to make that up some place. It probably would be in the reactor temperature. Now then, again, you can get as many ill effects as you can good out of it. We tried it and got more ill effects. Why do you improve your stripping? Do you have a smaller quantity strip or is it because of the characteristic of material you are stripping?

HAIG: We have always thought of part of the coke being due to physical adsorption on the catalyst surface leaving the reactor. That's a direct function of cat-to-oil ratio and there's not much you can do about it. If you are getting a per cent hydrogen on coke over say 10%, that means you're carrying around a lot of oil vapors, from your reactor through the stripper, that aren't getting displaced by steam.

WOODSIDE: You get more load with a higher catalyst oil ratio?

HAIG: If you are holding the steam rate the same in the stripper and you increase your catalyst rate, you're putting a fewer volumes of steam per volume of vapor coming down with the catalyst, so you don't have as many displacement stages. Assuming stripping is good in both cases, you still expect to get more coke yield with a higher catalyst circulation just due to the physical adsorption on the catalyst.

HYDROGENATING CAT FEED: Does anyone have any commercial or pilot-unit data on hydrogenation of cat feed or cat recycle. Particularly in regard to how your correlation for normal virgin feed stocks predicts the cat cracking you would get from a hydrogenated feed stock.

HAIG: Pilot-plant data definitely show a tremendous improvement in the feed as a cat-cracking feed stock, giving a lower carbon yield which permits higher conversion or higher throughput. Generally speaking, we have made studies and it looks as if you can get anywhere from 30 up to 50 cents a barrel increase in value as a cat feed stock. That's not free for nothing. It still costs you some money to hydrogen treat it.

CURRIN: I guess the main thing I would like to find out from that operation is, do your yields follow the normal prediction for virgin feed stocks, or do you find improvement for hydrogenated oil over and above normal predictions?

HAIG: The hydrogenation step changes the characteristics of the oil according to which we correlate our operations. Basically, raw and hydrogenated stock follow the correlations very well, but, the physical properties change. They will change in gravity. It will change your type analysis of the feed.

CURRIN: If you know the physical characteristics or inspections of your hydrogenated oil can you then use those properties to predict it's performance just as you would on an unhydrogenated feed stock?

HAIG: So far, that's the way it has worked out.

CURRIN: Was your experience on a virgin-oil hydrogenation or a recycle stock?

COMMENT: We had it on virgin and also on the visbreaker and coker gas oils, and on cat cycle stock in pilot-plant operation.

NOTE: Two succeeding articles in The Oil and Gas Journal will deal with cat reforming, alkylation, and miscellaneous problems. Part 1, which appeared in the Journal issue of March 31, also treated cat cracking. The articles are based on a panel discussion at the WPRA regional meeting at El Dorado, Ark.

New Index Information: Pipeline Construction

BY W. L. NELSON
Technical Editor and Petroleum Consultant

THE FOLLOWING indexes are based on those used by the Bureau of Valuation of the Interstate Commerce Commission in its study of interstate commerce (common carriers).† Although the indexes were adopted for use on pipeline costs, some of them should be useful for estimating the cost of other installations.

Itemized Cost Indexes—Pipelining

Basis 1946 = 100

	Oil pipelines*		Boilers								Electric motors		Electrical wiring and starters
	Installation	Complete	Installation	Material	Bridges (pipe & cable)	Buildings, masonry	Cathodic protection	Compressors, air	Cranes and hoists	Docks (concrete and steel)	Over 100 hp.	Small	
1946	100	100	100	100	100	100	100	100	100	100	100	100	100
1947†	106.5	114.5	113	115	111	115	110	114	114	113	110	110	120
1948	116	134	147	146	130	147	129	135	135	....	157	150	141
1949	121	141	153	153	140	166	130	141	136	....	165	157	142
1950	127	146.7	158	155	145	175	139	154	146	....	149	148	151
1951	132	154.6	166	167	155	184	145	165	154	....	159	159	162
1952	138	160.3	164	167	161	195	154	165	165	....	176	159	174
1953	144	168.3	170	172	155	201	159	171	171	....	176	165	180
1954	130	167.2	170	172	139	201	159	171	171	186	176	165	180
1955	129	170.8	181	184	139	212	159	182	182	198	187	176	192
1956	145	185.7	198	201	153	242	171	199	199	209	214	192	240

	Engines				Fire walls and foundations	Fittings (line pipe)	Foundations	Freight, pipe or machinery	Grading and landscaping	Instruments and gages	Pipe		
	Diesel	Gas or gaso.	Fences	Fire equip.							Line	Installation	Pipe coatings
1946	100	100	100	100	100	100	100	100	100	100	100	100	100
1947†	108	113	115	113	114	104	112	110	113	110	115	107.5	105.2
1948	133	139	153	139	129	126	138	133	145	133	133	117	112
1949	133	149	153	140	142	126	139	143	145	133	144	121	117
1950	146	152	167	144	142	126	138	146	158	133	151	129	117
1951	157	164	172	153	156	138	144	151	164	154	162	134	121
1952	157	164	172	153	162	138	162	163	164	159	166	140	126
1953	162	169	172	153	169	140	168	165	175	165	176	151	126
1954	162	169	172	153	175	140	168	165	175	165	184	134	116
1955	173	181	178	153	179	140	179	154	181	176	193	134	116
1956	183	192	184	158	199	182	190	159	186	192	207	148	121

	Poles, wood‡	Pumps			Radio equip.	Railroad sidings	Sewers and drains	Steel towers	Walks, roads and bridges	Water wells	Weigh scales	Wharves (timber)	Wood tanks (in place)
		Piston	Plunger	Centrifugal									
1946	100	100	100	100	100	100	100	100	100	100	100	100	100
1947†	140	119	119	119	110	112	114	113	113	110	108.8	127	121
1948	167	151	150	150	114	138	152	....	142	124	136	154	128
1949	174	166	157	157	114	141	152	....	142	124	136	170	128
1950	181	161	161	161	131	144	160	....	150	131	147	173	136
1951	189	173	172	172	132	151	165	....	158	138	158	178	143
1952	196	173	172	184	140	157	165	....	158	159	158	184	172
1953	204	178	178	190	134	162	171	....	170	165	163	184	179
1954	210	178	178	190	138	177	171	....	170	165	163	184	186
1955	218	190	190	202	143	187	177	198	175	176	174	184	190
1956	227	208	202	232	150	196	182	209	181	192	190	191	212

*Both trunk and gathering lines. †1957 index values assumed by the author of this page to establish the 1946 basis used in The Oil and Gas Journal as the basis for construction costs. All other figures are from Consent Decree Program of the Justice Department, hearings before the antitrust subcommittee (No. 5) of the Committee on the Judiciary, House of Representatives (Eighty-fifth Congress) Part 1, Volumes 1 and 2, Oil Pipelines (October 21-24, 1957).

‡See also steel towers.

Itemized Cost Indexes

COSTimating

THE COST INDEXES may be used to convert prices at any date to prices at other dates by ratios of the cost indexes of the same date. Itemized indexes are published each quarter (first weekly issues of January, April, July, and October). In addition, the Nelson Construction Cost Index is published in the first issue each month of The Oil and Gas Journal.

	1949	1952	1954	1956	1957	Nov. 1957	References*	Index for earlier years (The Oil and Gas Journal) in Costimating and Questions on Technology issues
Operating costs (based on 1956 as 100.0):								
Power, electric	109.9	105.1	108.2	100.0	101.5	102.1	Code 5-4	
Fuel, residual	66.0	81.0	86.5	100.0	117.6	111.0		
Gulf cargoes	69.5	78.3	85.9	100.0	123.8	119.1		
N. Y. barges	69.9	84.9	82.6	100.0	112.3	106.9		
S. Pedro bunkers	76.9	79.8	84.3	100.0	129.2	132.0		
Oklahoma	51.2	57.1	62.0	100.0	105.3	86.2		
Industrial chemicals	80.1	95.0	96.9	100.0	101.9	101.9	Code 6-1	
Phosphoric acid	86.7	93.9	96.6	100.0	100.9	103.4	Code 6-11-07	
Sulfuric acid	76.1	89.5	100.0	100.0	100.0	100.0	Code 6-11-09	
Ammonia	104.8	94.6	103.0	100.0	98.3	101.8	Code 6-11-13	
Lime		87.7	92.0	100.0	106.4	106.4	Code 6-11-29	
Sodium carbonate	76.7	84.5	92.9	100.0	104.3	104.3	Code 6-11-65	
Sodium hydroxide	73.5	80.6	90.0	100.0	103.6	103.6	Code 6-11-69	
Sodium phosphate	85.3	92.0	95.5	100.0	101.1	104.6	Code 6-11-71	
Furfural		93.6	100.0	100.0	100.0	100.0	Code 6-12-63	
MEK		94.5	94.5	100.0	105.2	107.5	Code 6-12-72	
Phenol		110.6	90.4	100.0	103.2	103.2	Code 6-12-83	
TEL	95.9	105.4	102.8	100.0	101.5	101.9	Supplier	
Operating labor (wages)	69.5	81.5	88.7	100.0	103.9	106.9	Employ. & Earn.	No. 55—Nov. 3, 1949
Productivity	85.5	90.2	97.1	100.0	98.0	95.6	Employ. & Earn.	Sept. 24, 1956§
Construction wages (1946 = 100):								
Skilled construction	133.9	157.9	174.6	187.3	196.3	200.3	Eng. News Record	No. 55—Nov. 3, 1949
Common labor	140.4	168.2	192.1	209.2	221.0	226.1	Eng. News Record	No. 55—Nov. 3, 1949
Refinery construction	137.1	163.1	183.3	198.2	208.6	213.2		No. 61—Dec. 15, 1949
Equipment or materials (1946 = 100):								
Arc-welding machinery	130.5	151.3	158.4	180.2	186.6	187.9	Code ‡11-76	May 2, 1955§
Boilers, tanks, and sheet metal	†134.8	†153.4	†147.3	†168.0	†176.3	175.9	Code 10-72	Apr. 21, 1952§
Building materials (nonmetallic)	151.2	134.8	143.6	154.0	159.0	160.9	Code ‡13	No. 22—Mar. 17, 1949
Brick-building	127.7	140.6	144.7	159.2	161.3	161.1	Code 13-41	No. 20—Mar. 3, 1949
Brick—fireclay	139.8	167.1	193.1	218.1	232.7	235.8	Code 13-42	May 30, 1955§
Castings (foundry products)	150.5	168.0	181.1	204.7	220.5	227.2	Code 10-15	No. 46—Sept. 1, 1949
Clay products (structural, etc.)	126.0	145.8	159.1	176.9	184.0	185.3	Code 13-4	No. 20—Mar. 3, 1949
Concrete—ingredients	123.7	132.7	142.1	153.3	159.7	160.7	Code 13-2	No. 22—Mar. 17, 1949
Concrete—products	121.7	132.6	138.5	144.9	149.0	149.5	Code 13-3	
Electrical machinery	130.9	152.4	159.9	175.0	188.5	191.2	Code ‡11-7	May 2, 1955§
Motors and generators	128.7	154.6	157.7	169.6	181.2	182.9	Code ‡11-73	No. 31—May 19, 1949
Switchgear	132.3	161.4	171.2	194.9	211.6	216.9	Code ‡11-75	May 2, 1955§
Transformers	129.7	148.0	161.9	175.4	188.0	190.6	Code ‡11-74	No. 31—May 19, 1949
Engines (composite)	124.8	146.5	150.5	164.0	174.3	176.9	Code ‡11-54	No. 36—June 23, 1949
Exchangers	133.0	165.8	171.7	190.7		203.4	Manufacturer	No. 2—Oct. 28, 1948
Copper base		175.3	156.8	198.8		185.5	Manufacturer	
Steel		152.3	190.7	178.6		217.3	Manufacturer	
Fans and blowers	152.2	183.7	192.6	222.4	236.1	240.9	Code 11-47	Feb. 17, 1948§
Hand tools	134.0	155.1	173.8	200.3	214.3	219.0	Code 10-42	June 27, 1955§
Instruments (composite)	123.1	146.2	154.6	182.1	187.4	186.2	Manufacturer	No. 34—June 9, 1949
Flowmeter (mechanical)	109.2	132.3	161.6	203.3	203.3	203.3	Manufacturer	No. 34—June 9, 1949
Flowmeter (air control)	132.4	160.5	179.6	203.9	208.2	208.2	Manufacturer	No. 34—June 9, 1949
Flowmeter (remote)	130.2	155.2	146.5	170.2	171.2	170.2	Manufacturer	No. 34—June 9, 1949
Potentiometer, 6-point	125.8	151.5	167.2	211.8	230.9	229.1	Manufacturer	No. 34—June 9, 1949
Potentiometer, air control	131.6	144.9	150.5	192.3	204.6	202.7	Manufacturer	No. 34—June 9, 1949
Pressure controller recorder	130.2	158.4	166.3	187.1	189.3	187.1	Manufacturer	No. 34—June 9, 1949
Pressure gage	100.0	108.6	108.6	119.2	119.2	119.2	Manufacturer	No. 34—June 9, 1949
Thermometer (recording)	118.6	149.4	152.8	170.2	171.8	170.2	Manufacturer	No. 34—June 9, 1949
Control valve	129.8	155.5	162.0	180.9	187.8	185.5	Manufacturer	No. 34—June 9, 1949
Lumber (composite)	165.2	203.2	197.8	214.5	201.8	197.4	Code 8-1	No. 7—Dec. 2, 1948
Southern pine	157.7	191.2	181.2	195.0	187.6	186.5	Code 8-12	No. 7—Dec. 2, 1948
Other soft woods	203.9	248.5	252.7	266.5	257.6	253.7	Code 8-13	No. 7—Dec. 2, 1948
Machinery—general purposes	131.9	151.8	159.9	183.8	196.5	200.5	Code 11-4	Feb. 17, 1949§
Machinery—construction	136.0	157.5	165.9	187.4	199.4	206.0	Code 11-2	
Machinery—oil-field	†132.9	†149.9	†161.9	†179.3	†193.2	†200.8	Code 11-51	Oct. 10, 1955§
Paints—prepared	142.8	155.7	159.0	169.2	178.1	180.6	Code 6-21	May 16, 1955§
Pipe, sewer	†119.3	136.9	140.1	160.5	168.0	168.6	Code 13-45	No. 22—Mar. 17, 1949
Pipe, black iron	152.2	179.0	195.0	233.0	256.1	263.0	Code 10-14-56	No. 19—Oct. 15, 1949
Pipe, 6-in. line	†152.0	174.0	200.5	241.2	268.3	275.3	Code 10-14-58	May 4, 1957§
Pumps, air compressors, etc.	135.9	155.6	166.5	192.0	210.0	211.6	Code ‡11-41	No. 29—May 5, 1949
Steel (iron and steel)	143.3	168.5	179.6	209.0	224.5	224.9	Code 10-1	No. 61—Dec. 15, 1949
Steel—finished steel	173.8	170.0	187.1	212.4	232.5	238.0	Code 10-14	July 25, 1955§
Plate	142.1	163.1	187.0	215.9	241.8	249.2	Code 10-14-26	Mar. 4, 1957§
Structural shapes	151.2	176.2	193.4	219.1	252.2	258.6	Code ‡10-14-31	No. 18—Feb. 17, 1949
Seamless tubes, 2-2¼ in.	140.9	168.8	199.4	235.5	265.4	273.5	Code 10-14-61	Sept. 5, 1955§
Valves and fittings	†132.9	190.8	197.1	231.9	243.4	248.2	Code ‡11-49 (10 items)	No. 46—Sept. 1, 1949
Nelson Refinery Construction (1946)	139.6	163.6	179.8	195.3	205.9	208.9		No. 61—Dec. 15, 1949
Nelson Ref. Operation (1956)				108.4		107.0		
Nelson Ref. Process Oper. (1956)				109.7		108.1		

*Code refers to the revised index code number of the Bureau of Labor Statistics, U. S. Department of Labor, "Wholesale Prices."

†Estimated base value for 1946.

‡Not exactly the some items as those published before July 7, 1952.

§Questions on Technology, The Oil and Gas Journal.

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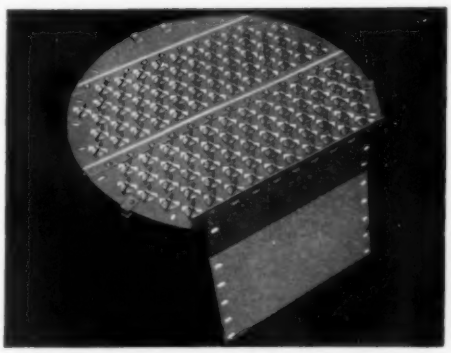

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Continuing progress through research

CREEK COUNTY, OKLAHOMA, now has several successful water floods. Gulf Oil Corp. is in its fifth year of flooding the lower Skinner sand in the Deep Fork unit and the zone has produced over 1 million barrels since the flood started.

Will shaly sands respond to WATER FLOODING?

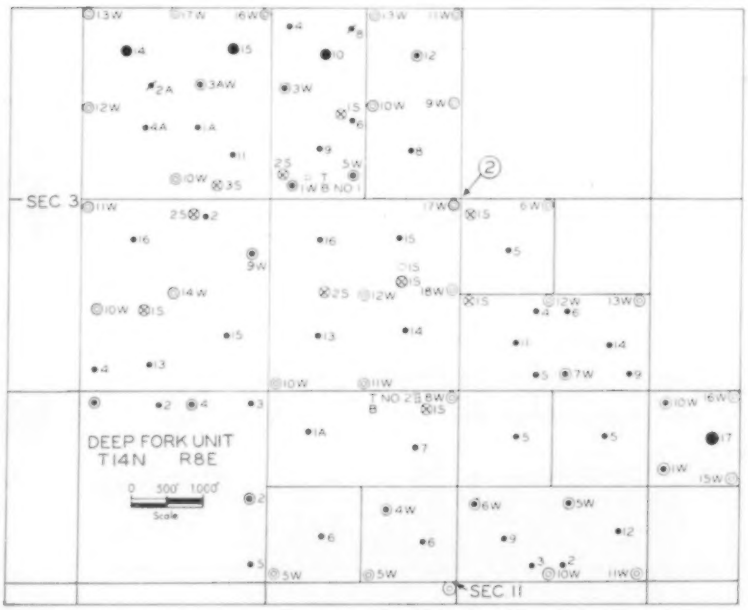
This 40-year old field is proving they will

BY NORMAN S. MORRISEY
Drilling-Development Editor

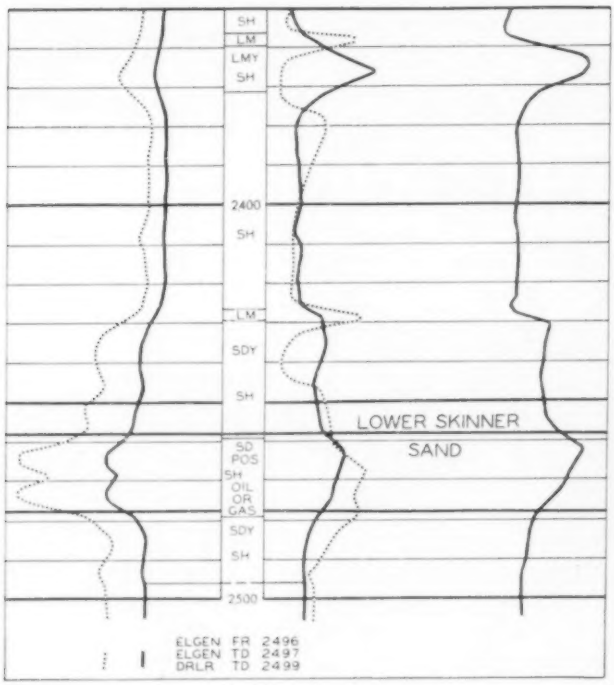
GULF OIL CORP. is justly proud of its Deep Fork water flood in Creek County, Oklahoma. Here Gulf and its unit partners are entering their fifth year of water flooding the lower Skinner sand at a depth of 2,500 ft. The results have been successful.

Initially the 1,120 acres were making 28 bbl. per day from 29 wells. First water was injected into the lower Skinner on February 10, 1953, and now the water-flood unit is making 1,100 to 1,200 bbl. of oil per day and 3,600 bbl. of water per day. Cumulative from Septemmer 1, 1952 to December 31, 1957 is 1,135,910 gross barrels.

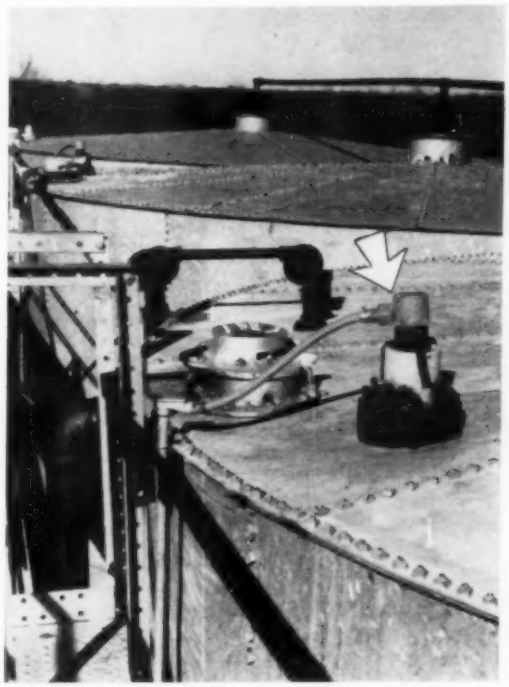
Today the unit has 36 oil wells and 38 injection wells. Gulf puts in 12,500 bbl. of water per day. Other operators in the immediate area pipe their salt water into the system. This, however, amounts to less than 5% of the input and is accepted as a neighborly gesture rather than simply



GULF uses a five-spot flood pattern with the producing wells at the approximate center of each 40-acre tract and the injection wells at the corners.



DRILLING DEPTH to the lower Skinner sand ranges from 2,450-2,500 ft. Here is a typical electric log through the zone.



THE WATER TANKS have automatic shutoff valves (arrowed) to prevent overflow.

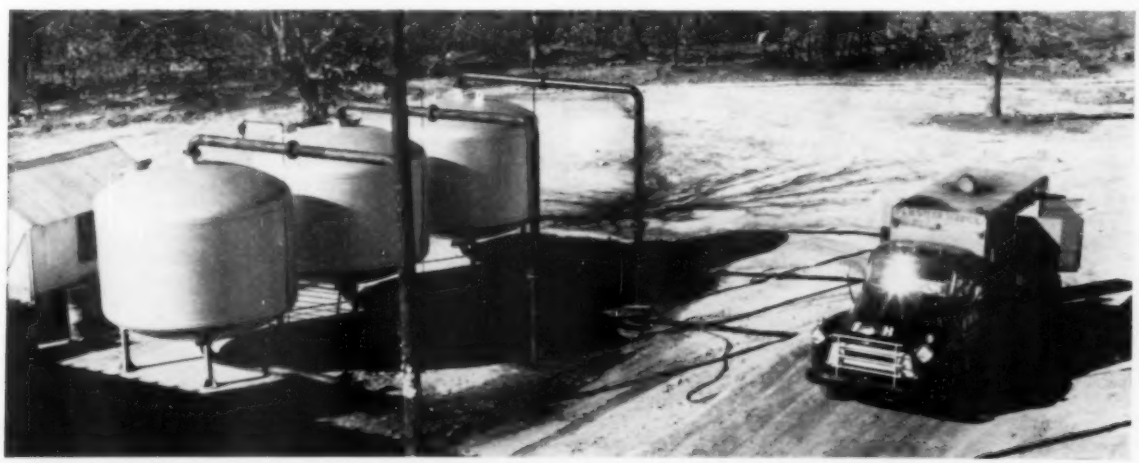
as a source of supply for the field.

The Deep Fork unit is an old field originally drilled up in 1919. When Gulf initiated the water flood, one-third to one-half the acreage had been plugged out. In a few instances, Gulf had to rework the old holes because after the water flood started, five abandoned producers started flowing.

On new wells, Gulf set casing 2 ft. into the sand and completed the well barefoot. The usual practice was to fracture the oil wells, but not the input wells. The pumping units are gas operated rather than electric, and the entire 1,120-acre unit is handled by three pumpers and a relief man. Eleven water wells supply the water.

By now the Deep Fork unit is a very smooth-running operation, and down time on both the producing wells and the water injection system is held to a minimum. Gulf uses a five-spot pattern with one producing well in the center of 40 acres and the water-injection wells at the corners.

Geology . . . Pay zone at Deep Fork is a tight shaly sand, the lower Skinner. This zone is found at a drilling depth of 2,500 ft. Original production was controlled more by changes in porosity and permeability than by actual structure. As a matter of fact, in many parts of Creek County, operators are now going back and developing this zone since it responds well to fracturing. The sand body at Deep Fork has a gross thickness of 15 to 25 ft., although in many instances this is not all pay.



SERVICE COMPANY is here cleaning the filters that had been contaminated by oil. Cost of this operation was only about 10% of the cost of replacing the damaged filter media.

Royalties—Or Research?

BY W. L. NELSON
Technical Editor—Refinery Consultant

THOSE REFINERS who do not develop their own patent protection systems or form alliances with patent-holding groups, must pay royalties on some of their process operations. Commonly accepted royalty rates are indicated in Table 1. Paid-up royalties are often 3 years' worth of running royalty, and according to Table 1, this represents about 12% of the process plant investment (upon which royalty is collected).

On such a basis, the average royalties or research costs that have been paid by the industry since 1932 are indicated in Table 2. Refiners either must pay royalties or they must maintain research staffs and protect themselves by patents. During most periods, the cost of research or patent affiliations is greater than the royalties collected from smaller refiners.

TABLE 2—Approximate Average Cost of Refinery Royalties (or for Research and Patents), cents per barrel.

	Royalties of refiners who must pay	Research cost of refiners that rely on patents—Refinery operations only	Research cost of refiners that rely on patents—Including petrochemicals	Estimate of total cost of royalty and research
1932	0.83			0.55
1934	0.87			0.60
1936	0.79			0.70
1938	0.85			0.90
1940	0.96			1.05
1942	0.72			1.00
1944	1.16			0.90
1946	1.57			1.35
1948	1.62			1.70
1950	1.88			2.00
1951	1.86			2.15
1952	1.94			2.25
1953	2.16	*2.78	*3.47	2.40
1954	2.16	†2.73	†3.46	2.55
1955	2.40	†2.88	†3.91	2.90
1956	2.66	*3.34	*4.61	3.20
1957	2.85	*3.42	*5.05	3.50
1958 est.		*3.38	*5.23	

*Involves estimates of the percentage of the industry total that is spent by refiners.
†API figures raised by 10% because they summarized only 72 refiners.

Such costs as those of Table 2 must be most approximate. However, the research costs are based on the sound information of the American Petroleum Institute (OGJ, Dec. 3, 1956, p. 65), for the years 1954 and 1955. The other research and development costs are those of the McGraw-Hill Department of Economics (Chem. Week, December 28, 1957, etc.) The entire industry spends about 0.7% (0.77% during 1956 but only 0.61% during 1951) of its sales dollar on research, and the refining branch of the industry spends even a larger percentage. The royalty costs that are paid by the smaller refiners were obtained by use of the royalty rates of Table 1 along with the capacities of the various processes that are conducted in an average U.S. refinery. It was estimated that the royalty costs of Table 1 should be reduced by 40% because many of the refiners have paid-up royalty rights. Likewise it was estimated that only 40% of the small refiners pay thermal cracking royalties (i.e., inspection service fees). Thus for the year 1957, the per barrel royalty payments were:

	Bbl. per bbl. crude	Royalty, ct./bbl.
Thermal cracking, reforming and coking	0.242	0.174
Visc. breaking	0.04	0.014
Catalytic cracking	0.418	1.250
Catalytic reforming	0.14	0.500
Polymerization	0.014	0.174
Alkylation	0.028	0.336
Catalytic desulfurization	0.098	0.088
Lubes	*0.082	*0.250
Desalting, electrical	0.400	0.050
		2.846

*Half of lube capacity processed by licensed processes at an estimated 6 cts. per bbl. unit royalty.
Greater thermal cracking royalties were charged prior to 1942, ranging up from the 40% to a full 100% during 1942.

TABLE 1—ROYALTY RATES REPORTED IN THE LITERATURE*

Royalty	Investment (‡1956) bbl.	% per year of ‡investment
Alkylation—20 ct. per bbl. (1956)	$1,400	5.2
Benzene recovery from reformate—1 ct. per gal. (1955)	3,900	3.9
Cracking, catalytic—5 ct. per bbl. (1955)	500	3.6
Cracking, thermal—†None or 3 ct. per bbl. (1955)	230	0-4.8
Cracking, thermal—3 ct. per bbl. (1942)	§102	§11.0
Desalting, electrical—0.2-0.4 ct. per bbl. (1952)	5	
Desulfurization, simple—0.5 ct. per bbl. (1954)	135	1.7
Desulfurization, hydrogen recycle—1.5 ct. per bbl. (1954)	195	2.8
Reforming, catalytic—5-7 ct. per bbl. (1956)	460	4.8
Reforming, thermal—†None or 1.5 ct. per bbl. (1955)	138	0-4
Polymerization, catalytic—21 ct. per bbl. (1955)	1,100	7.0
Sweetening, Tannin (simple)—0.33 ct. per bbl. (1947)		
Sweetening, Solutizer—0.5 ct. per bbl. (1947)		
Viscosity breaking (and Delayed Coking?)—†None or 1.5 ct. per bbl. (1953)	138	0-4
Average is about (1956)		4.0

*Usually below these figures by various special arrangements, by making a single payment (paid-up royalty), escalated for size, etc.
†Not a royalty but a consulting and inspection service fee.
‡Approximate. For average-size plants.
§1942.

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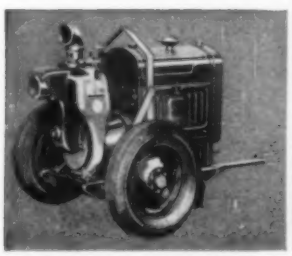
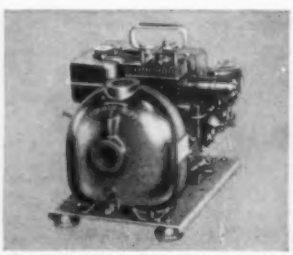

Contractors' Pumps — 3" to 10"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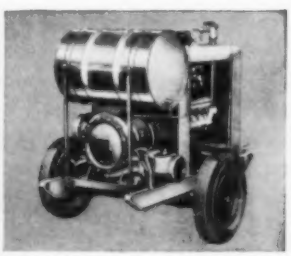
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Cycoil Oil Bath Air Filters

MODERN DRILLING

Counterbalance vs. single crossover

WHERE THE line previously crossed over a complete line pitch in one action, the counterbalance system takes a line pitch in two separate movements.

The two crossover points are exactly opposite one another on the drum core. On the single-crossover pyramid spooling system, the parallel grooved area covered about 75 to 85% of the circumference of the drum. In counterbalance spooling, the parallel grooved area has from 70 to 80% of the drum circumference.

These parallel grooved areas are highly important because it is in the parallel grooved area that progressive grooving is made possible. Progressive grooving eliminates line slippage and cutting through on the preceding layer of line.

For complete satisfaction in wire-line spooling under all conditions, the counterbalance spooling is the most mechanically perfect spooling system yet developed because of its smooth and correct spooling pattern. It is the only system unlimited to the number of layers to be spooled on the drum and regardless of the speed of the drum.

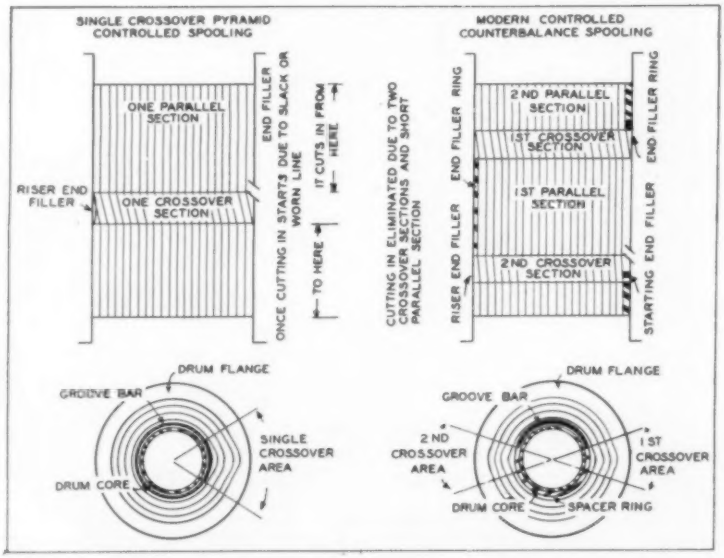
This type spooling will allow the operator to wear his line down to a smaller diameter and still permit better service than possible with any other spooling system.

With single-crossover pyramid spooling, there is only one crossover point on the drum (as illustrated in line drawing). With this type of grooving the chances of cutting in at the parallel area are great when there is excessive line wear and more than three layers of line are spooled onto the drum core.

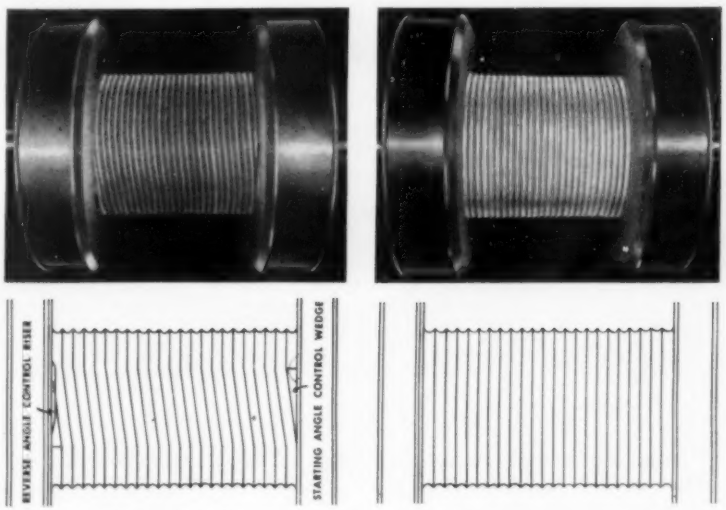
Also there are instances whereby the line builds up at the crossover point sometimes causing the drum to have a highly undesirable out-of-balance condition, which sets up vibration at high speeds.

Improvements achieved by the twin-crossover counterbalance spooling system over the single-crossover pyramid type are: (1) the elimination of wire line cutting in; (2) the smaller crossover angle reduces pinching and scrubbing, and facilitates faster spooling; (3) reduction of wire-line whip, and (4) elimination of vibration due to balanced-line spooling.

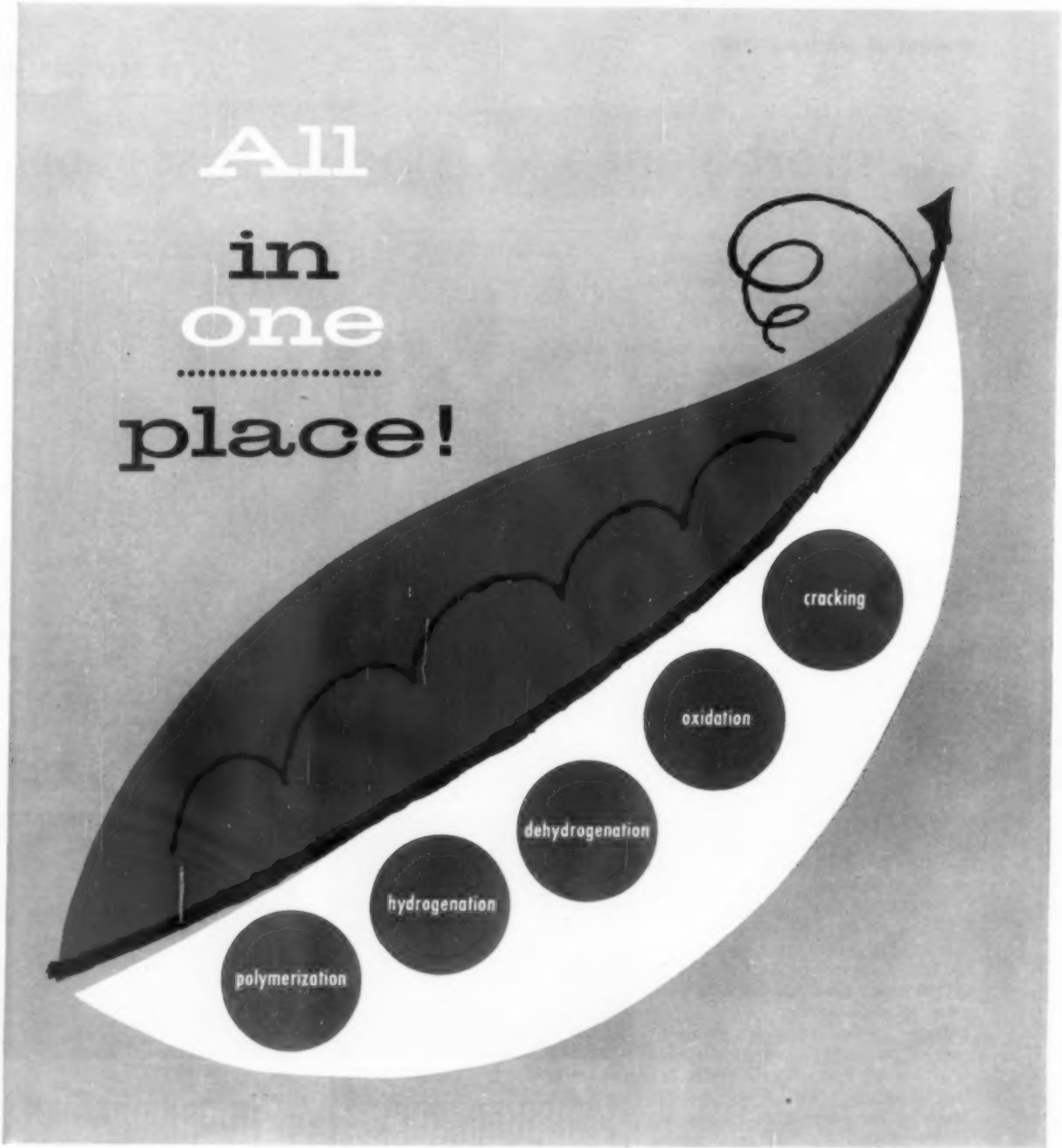
Taken from Lebus-International Engineers, Inc., wire-line-spooling handbook.



SINGLE CROSSOVER PYRAMID, left, causes excessive drubbing and uneven wire-line buildup at the single crossover point. Counterbalance, right, offers less cutting in and smoother wire-line buildup at balanced crossover points.



CONTINUOUS LENGTH of parallel grooves in single-crossover pyramid boosts chances of undesirable cutting in on successive layers. Crossover area (left) takes up 15 to 25% of the drum circumference. Parallel area (right) takes up 75 to 85%. In counterbalance drum, this long parallel length is broken in two places by half-crossovers instead of in one place by single full crossover.



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This new series gives tips on operation of

Compressors in the refinery

OPERATING PROCEDURES, auxiliary systems necessary for compressor operation, compressor safety devices, and general precautionary measures are some of the things to be observed when operating compressors.

Many large refinery compressors are driven by gas engines. Other large compressors are driven by steam reciprocating engines or electric motors. Many of these large compressors handle flammable process gas.

When operating such large moving machinery they must be handled correctly to avoid serious accidents. Several serious compressor accidents and numerous near accidents have occurred that could have been avoided if correct operating procedures had been followed.

There is a common rule to remember when operating compressors or other moving or rotating machinery. If you hear or feel any unusual noise, knock, or vibration in the machine, take prompt action to have the machine checked by qualified personnel.

The following discussion is based on Clark and Ingersoll-Rand compressors. These compressors are very similar to the Cooper-Bessemer, Worthington, and the other types in most respects.

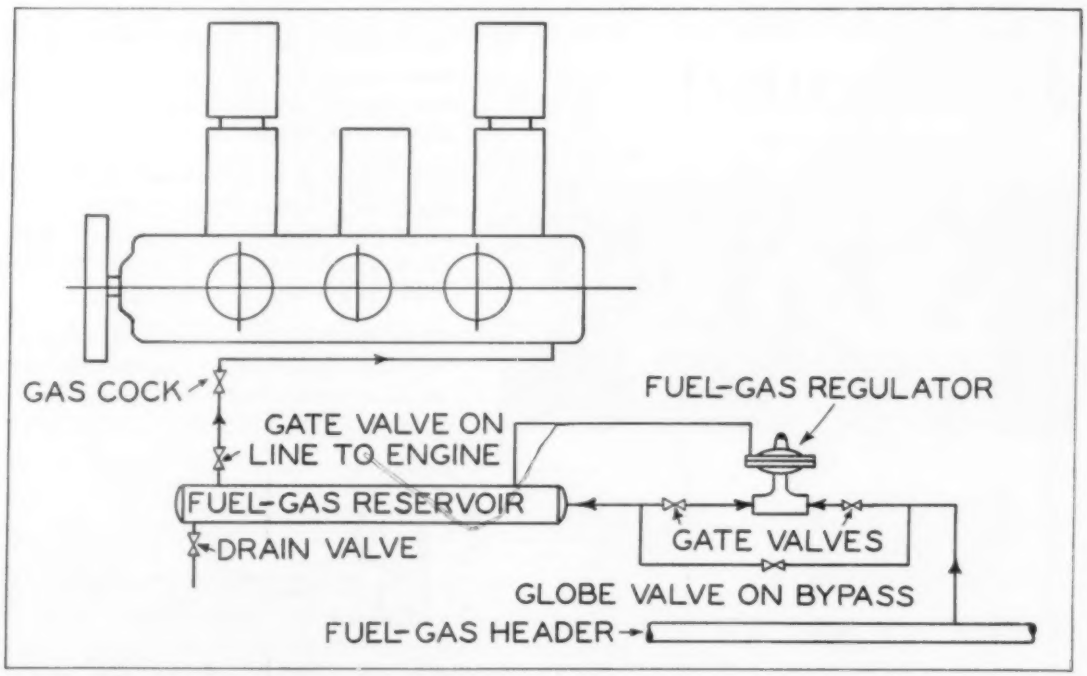
Before discussing starting, stopping, loading, and unloading procedures it will be necessary to understand various fuel-gas systems, cooling-water systems, starting-air systems, and safety devices that are provided in each compressor installation.

This material taken from process-training-program manual, Baton Rouge, La., refinery of Esso-Standard Oil Co.

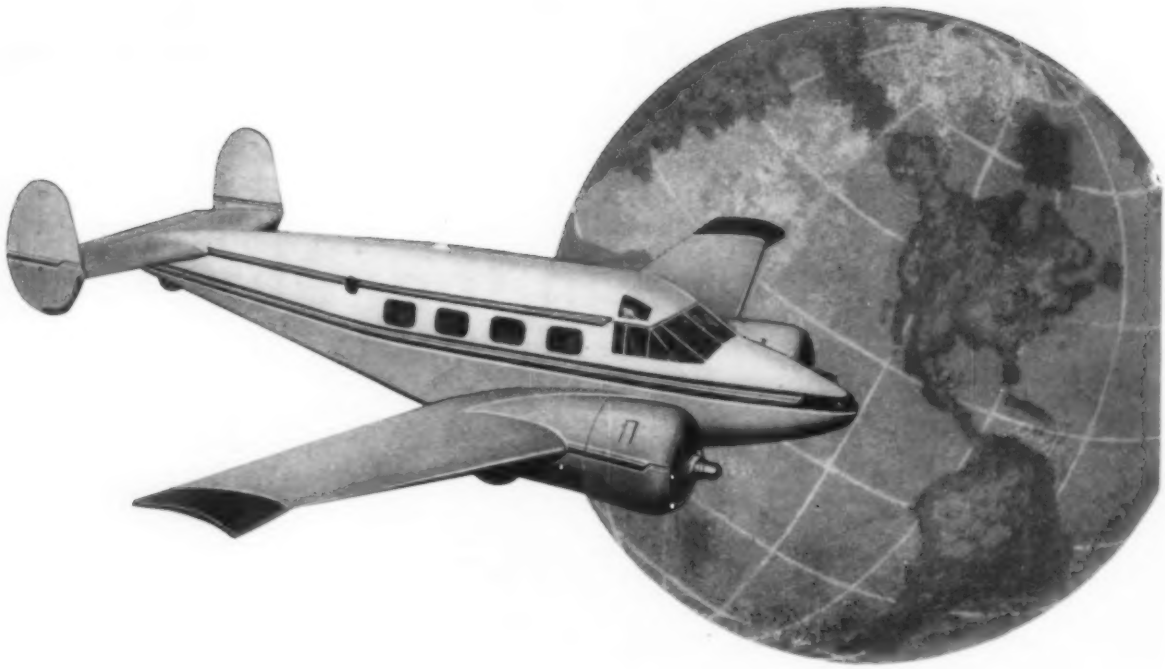
Fuel Systems

Many gas-engine-driven compressors use natural gas as a fuel. A typical compressor fuel system is shown in Fig. 1. The proper fuel gas pressure and mixture must be maintained at the compressor for the compressor engine to operate properly.

Meter and instrument personnel have the primary responsibility for keeping gas regulators in proper operating condition. However, you should be familiar with the system if you expect to get efficient operation.



TYPICAL COMPRESSOR FUEL SYSTEM. Proper fuel gas pressure and mixture must be maintained for efficient operation of the compressor. Fig. 1.



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This crew was on the job for Big Chief in Oklahoma's Grady County as . . .

Knox test hits 17,000 ft.

The second well to reach the 17,000-ft. depth mark in Oklahoma's record breaking Knox field, on the Grady-Stephens county line, is being drilled by Big Chief Drilling Co., Oklahoma City.

It is British-American Oil Producing Co.'s 1 Teter, located on the west side of the northern sector of this deep field, in Grady County.

At the 17,000-ft. depth, the hole still lacked 484 ft. of equalling the field's deepest hole another British-American well (1 Krieger), drilled by Viersen & Cochran, of Okmulgee, Okla.

The latter well, recently completed, also set another production depth record for the field. It is a good gasser from the lower Simpson-Oil Creek zone, perforated at 16,526-46 ft.

Including these, 11 wells in this field have drilled to or below 16,000 ft. Five have been productive of oil or gas and condensate in sands below 15,000 ft.

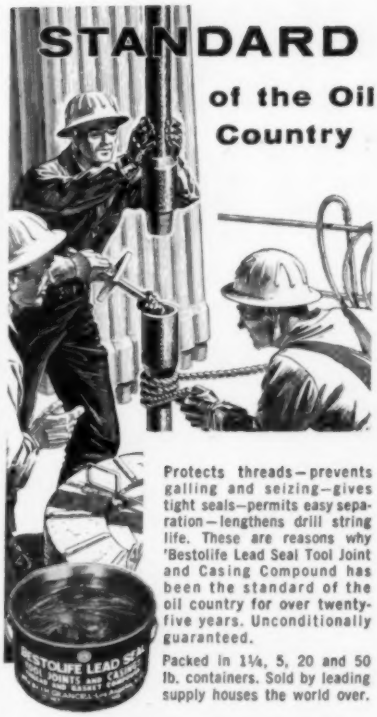
Big Chief's well has passed several potentially productive gas zones. In one, the Springer, it blew out while drilling at 10,816 ft. There the well caught on fire and burned the rig. With another rig, the old hole was sidetracked at 7,915 ft. and the new hole drilled to 15,482 ft. At that depth, it was necessary to plug back 100 ft. and sidetrack again. Drill-stem tests flowed gas in two sands below 15,000 ft.

The hole now has 7-in. casing to 15,139 ft. It was started with 20-in. conductor to 120 ft., and 13-in. surface casing to 3,491 ft.

IN PICTURE . . . Bill Bryant, Alex McKuirion, Marvin Love (driller), and Lloyd Shipman, crewmen; Jack Driggs, British-American drilling foreman; H. C. Gerlock, Big Chief pusher; E. W. Johnson, another driller; and (kneeling) George Sewell, British-American geologist.

Falcon Seaboard Rig Goes 250 Days Without Injury

A rig which has operated 250 days on 14 locations without a lost-time injury of any kind wins Falcon Sea-



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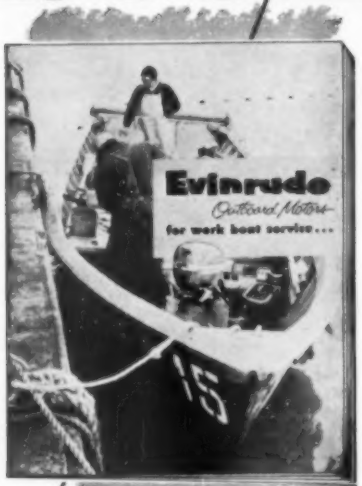

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board Drilling Co.'s latest annual "Rig-of-the-Year" safety award.

The rig, Falcon's No. 27, set its record while drilling in Oklahoma and Kansas during 1957. Its tool pusher is C. O. (Shorty) Pritchett. Drillers are Halo Ramsey, D. J. Warden, and Jack Rush.

It is a U-34 rig with a 96-ft. jackknife derrick.

Who's getting the drilling contracts?

Dorris Ballew, Natchez, Miss., now has two rigs running in the recently opened Little Creek area, on the Lincoln-Pike county line, in southern Mississippi. His second rig, just starting work in the area, is on a contract job for D. A. Biglane at a stepout location southeast of the discovery. His previously reported initial rig in the area is about to finish up on its first well, a southwest offset to Shell Oil Co.'s discovery well, which he drilled for his own account. Two other contractors, Reading & Bates, Inc., Tulsa, and Drilling & Exploration Co., Dallas, each have a rig at Little Creek, in addition to Marshall Young, of Brookhaven, Miss., who drilled Shell's discovery well. The wells call for 11,000-ft. drilling.

Brown Drilling Co., Long Beach, Calif., has a new wildcat operation in the Los Medanos area of Contra Costa County, California. Location is about 25 miles northeast of San Francisco, and about 7 miles from nearest production (gas), in Suisin field. Drilling is for McCulloch Oil Exploration Co. of California. The area's only other test, drilled in 1952, had gas showings in sands from 5,100 to 5,500 ft.

Green & Dreblow Drilling Co., Bakersfield, Calif., is moving a rig to a wildcat location northwest of the old Taylor Canyon field, in northwestern San Luis Obispo County, California, where it will drill a 6,000-ft. test for Harrell Drilling Co. Nearest well in the field was drilled 7 years ago, getting oil production at 5,600 to 5,800 ft. Location is on Harrill's Southern California Co. lease in 25-32-19.

Halbert Drilling Co., Tyler, Tex., has a rig working on a British American Oil Producing test 3 miles northwest of Slocum, in southern Anderson County, East Texas. It is a 6,000-ft. Woodbine test, on a Southern Pine lease in the Robert Erwin Survey. Hole already is getting down to contract depth.

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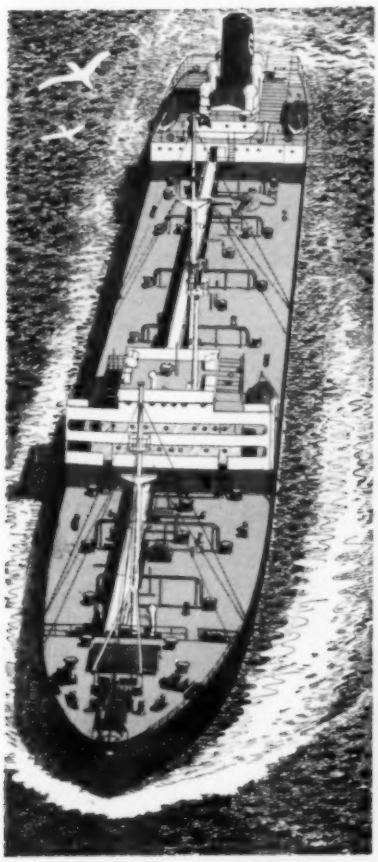
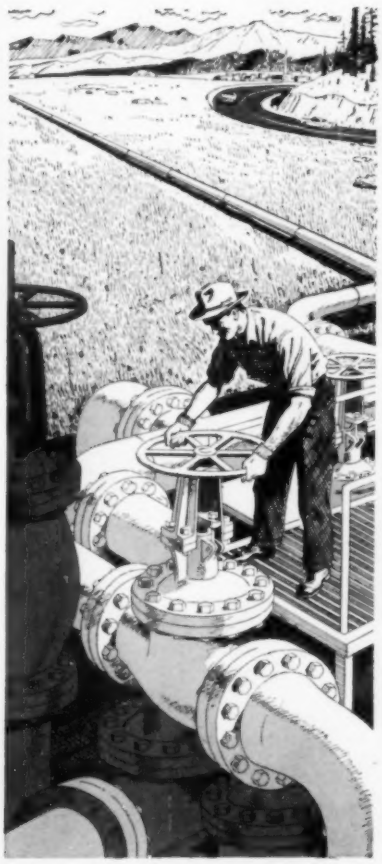
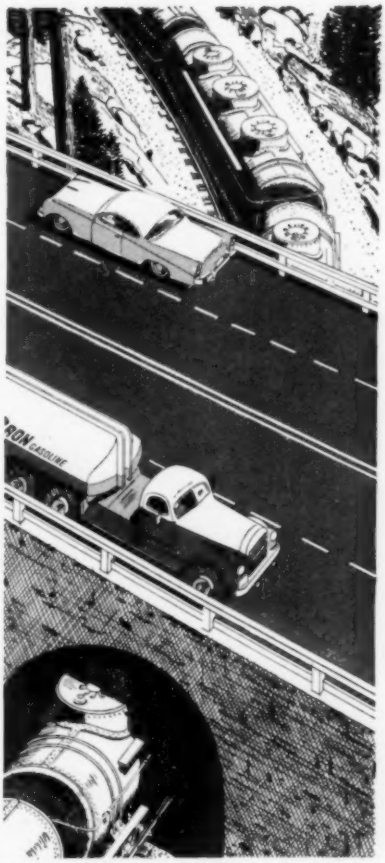
How Standard's busy transportation system helps hold down prices of petroleum products



Twenty-six Standard Tankers—plus others that we charter—sail the seas to keep crude oil moving to refineries and more than a hundred finished products returning to customers. A supertanker can hold enough gasoline to run your car over 10,000 years. On inland waters, tugs, barges and smaller tankers take over the transport job.



Rivers of crude oil and products flow through 3364 miles of pipelines that Standard operates in the Western hemisphere. Also, we pay to send products through other companies' pipelines. They in turn use our lines. Through these "steel arteries," oil is pumped over mountains, as high as 9500 feet, under rivers and through deserts.



Miles of railroad cars, thousands of trucks, trailers, and semi-tank trucks move finished products to distribution points, service stations, airports, marine stations, farms, factories and military installations. Standard either operates or leases nearly every form of transportation to keep vital oil supplies moving.

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A few dollars invested in Galvomag anodes pays handsome dividends in terms of longer service life for equipment, less maintenance and fewer service interruptions. For underground metal structures, magnesium anodes are your best bet. For facts, figures and technical assistance, contact one of the firms listed below or write to us. THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. MA 1437S.

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YOU CAN DEPEND ON DOW

Contractors and company men sound off about . . .

Contracting for pipeline maintenance

BY GENE KINNEY
Assistant Pipeline Editor

THE DESIRABILITY, economics, and dependability of using contractors for pipeline maintenance have been examined by a panel of contractors and company executives at a meeting of the Pipe Liners Club of Tulsa. The discussion indicated that the practice of contracting maintenance is becoming widespread, although companies have a variety of policies, and that station operation and gaging are contracted in isolated cases.

PANEL MEMBERS

O. R. Burden, O. R. Burden Construction Corp.; A. M. Hill, Service Pipe Line Co.; G. P. Merrell, Pipeline Service Co.; Walter E. Biery, Mid-Continent Pipe Line Co., moderator; Harry Nelson, Cities Service Pipe Line Co.; I. B. Tietze, Phillips Pipe Line Co., and H. D. Chrislip, Kerr-McGee Oil Industries, Inc., (at far right in photograph), president of the Tulsa Pipeliners club.

Q—Do you permit a contractor to tie in to an operating line?

A—In West Texas contractors handle all of one company's maintenance, including tie-ins. However, when company personnel are available, they prefer to do their own tie-ins.

A second company uses its own personnel exclusively. It uses this reasoning: company personnel are a known quantity; contractor personnel an unknown quantity. The company prefers to take no chances.

A third company lets the contractor make tie-ins under its supervision. It follows the policy of supplementing company personnel with contract crews whenever it is convenient or necessary.

A contractor reported that he makes tie-ins for some companies, and for others he doesn't. He has some employes who could do tie-ins competently and with complete safety and some who couldn't. They don't have the experience. Most contractors like to think that they can come up with an answer in personnel for any type of work.

A second contractor said he makes tie-ins under supervision of companies and makes them often. The company directs his foreman how to do the job.

Q—What is the division of responsibility when a contractor is tying in a line under company supervision and an accident occurs? Who is liable?

A—One company's assumption is that the contractor picks up the tab. It has had no such accidents, but operates under the understanding that the liability would be on the contractor.

A second company's contracts are so drawn that the contractor is independent and hence is responsible for what he does. What the company asks for is results; it doesn't spell out in great detail how they are to be obtained.

A contractor conceded that if his men were directed to make a tie-in and an accident occurred, it would be his responsibility.

Q—How dependable would contractor maintenance be on a trunk line 700 to 800 miles long? On what cost basis would the contractor be retained for emergencies such as line breaks?

A—This would be a big job for a contractor to handle, but one contractor believes it could definitely be done and this method of handling would not only be dependable, it would also be desirable.

A contractor always has a surplus of men and equipment. If a company called a contractor to repair a break, he could be on the job with experienced men quicker than the company could, according to one contractor's

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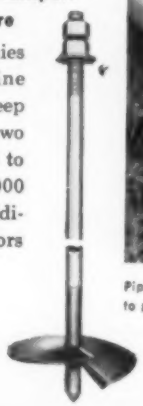
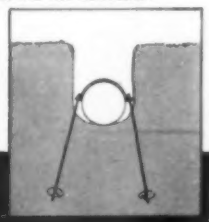
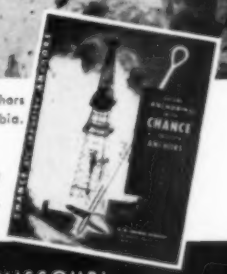
More and more progressive pipeline companies and contractors are turning to Chance Pipeline Anchors to eliminate costly counter weights to keep pipe from floating. A complete unit, consisting of two anchors and pipe saddle bracket, weighs from 29 to 180 pounds and will hold from 5,000 to 30,000 pounds. The anchors can be installed without additional excavation. Light power tools screw the anchors down in seconds.





Cut away view of anchors and bracket installed in trench.

Pipeline crew installing Chance Pipeline Anchors to prevent floatation problems in British Columbia.



Write for complete catalog and application information.

A·B·CHANCE CO. CENTRALIA, MISSOURI TORONTO, ONTARIO, CANADA

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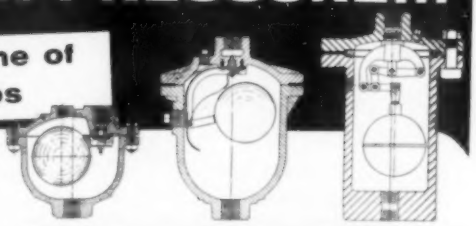
Select from the complete line of Armstrong Ball-float Traps



Corrosion-Resistant Parts—stainless steel standard . . . also available in nickel, monel, various grades of stainless, and other weldable materials which can be fabricated, cast or forged.

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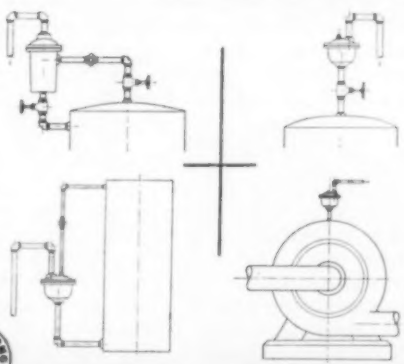

Send for Helpful Bulletin—Bulletin 4501 tells how to select and install gas-relief traps, gives complete physical data and prices of Armstrong vent traps.

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belief. As for the basis of payment, there would be a specified price for labor for time on the job, a specified price for different pieces of equipment depending on how long it was required to be in service.

The contractor keeps personnel year round and pays these key men full time. He has to keep a good staff. They're not always busy, so emergency work is very attractive to the contractor because it employs personnel profitably at a time when they would otherwise be idle. The contractor believes he could save a major pipeline company thousands of dollars a month.

Q—How could a contractor give good emergency service on one end of a 700 to 800-mile trunk line if he is headquartered at the other?

A—The contractor could do one of two things: He could serve the line from two points, locating spreads in areas which would permit the most rapid service to any trouble spot anywhere on the line. He could also subcontract the half of the line farthest from his headquarters to a local contractor who would already have a spread in the desired spot, or the company could itself retain two contractors strategically located along the line.

Q—How much work would the contractor have to have under an emergency contract without requiring an overhead clause?

A—It would be the contractor's problem to solve by keeping his crews busy with other work in the area.

Q—In case of a bad break, when you need to act fast, wouldn't there be some time delay before a contract crew could get on the job?

A—If the situation is very serious, according to a contractor, then everyone concerned, both contractor and company, should play a part. He believes that contract crews could be on the job as quickly as company crews.

A second contractor who has handled emergency work outlined this procedure: In case of a line break, the company telephones him or his superintendent who then calls his foreman, gathers tools and equipment and gets a gang together, all within 30 minutes to an hour and they are en route to the trouble scene. They work round the clock 1 to 2 days until the emergency is over. Labor will be relieved but key men will stay on the job until it is done.

Q—Are open-end contracts feasible for maintenance work and do contractors favor maintenance contracts without an escalation clause?

A—One contractor believes open-end contracts are feasible. He operates successfully under them and also under 12-month contracts. He considers an escalation clause, although undesirable on the part of the company, to be fair particularly in the event of almost certain increases in costs.

He has worked under the same contract for years. From time to time he may try to renegotiate to adjust to changed cost situations but always is able to work out a mutually satisfactory arrangement.

Q—Why does a company ask for bids and then do its own work?

A—One company pleads guilty to this practice and justifies it in this manner: The engineering department prepares estimates for a job and invites bids. If the bids are near engineers' estimates, the job is awarded to the best bidder, usually the lowest.

Sometimes the contractors are so far out of line with engineers' estimates, the company feels compelled to trust its own estimates and do the job with company personnel. The company may get burned in some cases, but it believes this to be the best policy.

A second company never does its own maintenance or construction work. It chooses the best bidder who is frequently not the lowest bidder.

Q—Have contract personnel been used in company operations such as gaging or operating pump stations?

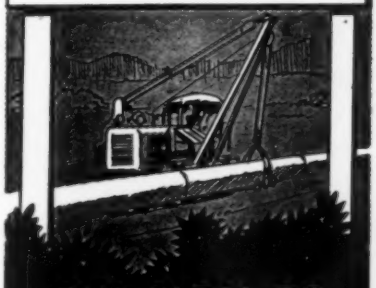
A—One company contracts operation of a pump station in West Texas. No company men are located at the station which is in a remote spot from other company operations. The company plans to install automatic equipment and go to unattended operation, however, and reports a payout of new investment within a very few months. This same company has used contract personnel for office work, too.

Small companies in the Denver-Julesburg basin and in Wyoming are reported to be contracting gaging where both trucking and pipeline runs are involved. It was pointed out that at one time the War Emergency Pipelines were operated and maintained by a single contractor.

Q—Would company insurance rates be affected if maintenance were contracted?

A—A contractor said the rates should decrease in most cases since construction and maintenance, being the most hazardous phases of pipeline work, carry higher premiums, and elimination of this coverage would reduce company rates over-all.

O. R. BURDEN
Construction CORP.
GENERAL PIPELINE CONSTRUCTION
TULSA, OKLAHOMA



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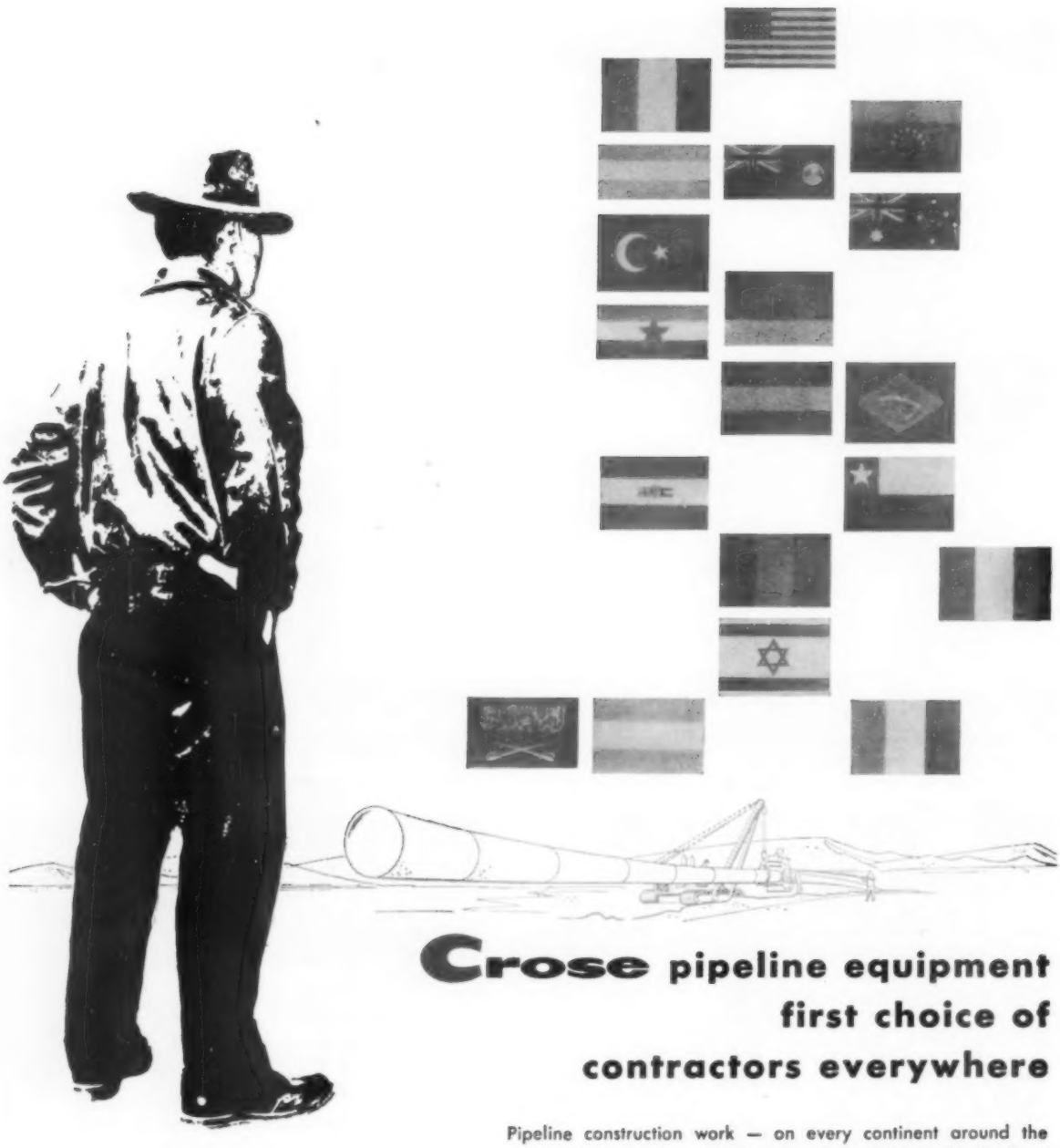

Crose pipeline equipment first choice of contractors everywhere

Pipeline construction work — on every continent around the world — goes faster and more economically for hundreds of contractors who depend upon the complete line of Crose equipment. Ruggedly built for top performance anywhere, Crose equipment is available through many strategic supply points.

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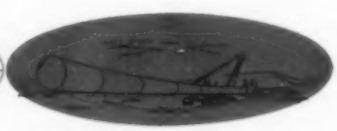

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B-132

On the Job

PIPELINING

Q—Is it feasible to contract maintenance on an emergency basis only?

A—A company believes this is not practical. This executive wants a gang where he can lay his hands on it on a moment's notice. The reason is, when you need an emergency crew, you need it bad. You can't just let oil run down the hill.

This company contracts a maintenance crew full time in West Texas on the theory it's worth something just to have men available. Occasional maintenance is contracted by this company in Oklahoma, and reports considerable saving on contract labor.

Q—How can you write a good working contract for overhauling mechanical equipment in place?

A—One company reported considerable experience in contracting engine maintenance and such items, and is pleased with the results and convinced it is saving money.

Another reported trouble in arriving at a basis which would guarantee that the work would be done at a fair price.

It was stated that horsepower alone is not a sufficient basis for pricing, nor is a unit price for such jobs as pulling pistons, reconditioning heads. Neither was this pipeliner satisfied with contracts on an hourly basis.

Another executive reported his company has hired contractor mechanics to troubleshoot on some small units. The method works very well, especially when you are short of labor. It is particularly satisfactory when you happen to be acquainted with the capabilities of the contractor and his men.

Q—What is the best method of selecting welders, checking their competence, and inspecting their performance to assure satisfactory maintenance work?

A—The contractor hires his own welders who are required to make qualification tests according to company standards which are generally accepted throughout the industry. The two standard tests are the radiographic and tensile or destructive test.

Q—Is a preliminary test sufficient? A welder may spend considerable time on the qualification test, then work twice or three times as fast once he gets on the line.

A—Successive tests should be given a welder, one company believes, as the job progresses, depending on the quality of his work as shown by X-ray.

Catawissa PERFECT SEAL Unions

HOT FORGED from solid, rectangular steel bars, designed and produced for dependable, long-life service under the severest piping conditions!

A TYPE FOR EVERY USE!
FOR ALL PRESSURES!
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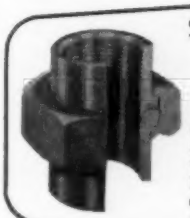

Standard & Double Extra Heavy UNIONS

Available with screwed or socket weld ends. 3000-lb. sizes ⅛" to 3"; 6000-lb. sizes ⅛" to 2".

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With screwed or socket weld ends. 3000-lb. and 6000-lb. service.

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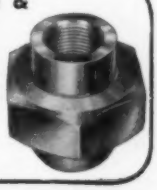
With screwed or socket weld ends. 3000-lb. and 8000-lb. service.



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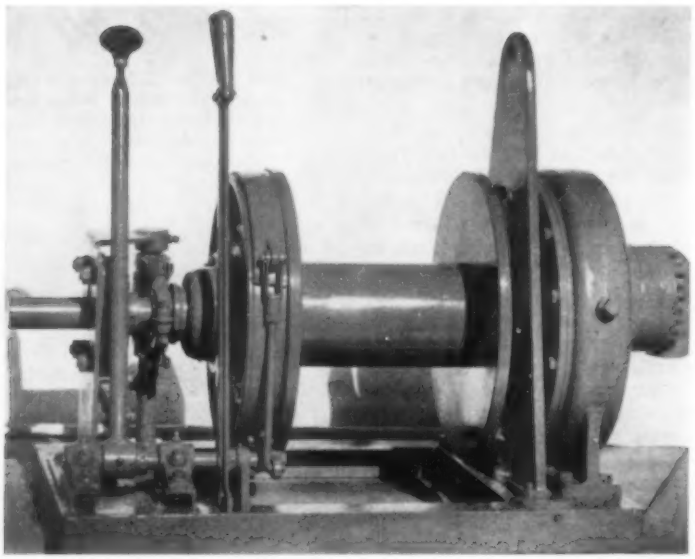
SHOWCASE...

NEW EQUIPMENT



Hydraulic motor turns wire-line reel

The new Carey Model HPS wire-line reel provides 215-lb. pull, is skid mounted, and is useful for several oil-field applications. It can be used for bottom-hole pressure and temperature surveys, sampling, fluid-level testing, and for setting bottom-hole chokes.

The machine is driven by an enclosed, oil-bath-lubricated, spur-gear reducer. Control is by hydraulic four-way valves for forward and reverse. It's equipped with a friction clutch and external-band brake.

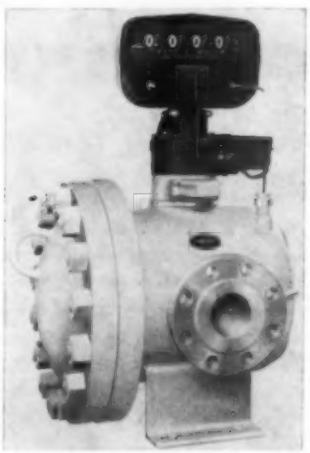
Drum capacity is 17,000 ft. of 0.072-in., 15,000 ft. of 0.080-in., or 12,000 ft. of 0.093-in. line. Line speed is 0 to 1,180 ft. per minute.

Over-all dimensions are: height, 23 in., length, 26¾ in.; and width, 17 in. Other sizes are available too. **Write or call: Carey Machine & Supply Co., P. O. Box 63, Houston 1, for details on Model HPS wire-line reel.**

●

Temperature Compensator Corrects Readings to 60° F.

The automatic temperature compensator with a full-range gravity selector is for use with Brodie Birotor meters in pipelines, loading racks, LACT systems, refineries, and other applications. It is said to be equally effective in handling volatiles, viscous products, and crudes.



Atmospheric temperature effects are cancelled by a bellows. The gravity-selector dial may be set to the coefficient of expansion or API gravity of the liquid being metered. The net reading is automatically adjusted to the volume which would be metered at a base temperature of 60° F.

The compensator is available with a single Brodimatic or printing-counter reading in net gallons only, or with dual counters showing both net and gross gallonage. Depending on the expansion coefficient of metered liquid, the unit will compensate for temperatures as high as 93° to 150° F., or as low as 27° to —30° F. **Write or call: Ralph N. Brodie Co., San Leandro, Calif., for Bulletin 652.**

Send this **Showcase Coupon**

to the Manufacturer of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

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Described in OIL AND GAS JOURNAL - Issue of April 7, 1958

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ADDRESS.....

CITY.....STATE.....

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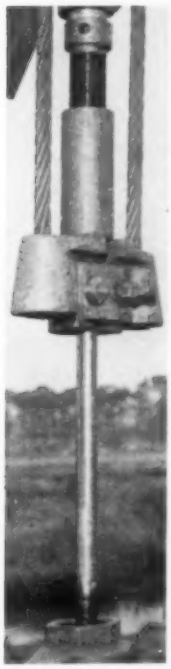
Polished-Rod Adjuster Helps Lengthen String



Called the "Pumper's Bumper," the polished-rod adjuster is said to be an all-around, practical, and safe method of correcting gas and sand lock of subsurface pumps. By using the "bumper," pumpers can lengthen the string so that the pump may be bumped to eliminate locks. It also permits accurate adjustment of the sucker-rod string, the maker says.

Accidents which could injure the workers or damage equipment are eliminated as the pumper need not be loosened from the polished-rod clamp, the maker adds.

Model 2875 fits 1⅛ and 1¼-in. polished rods and sells for $39.95. Model 375 fits 1⅜-in. and 1½-in. rods and is priced at $87.50. **Write or call: Western Pipe & Steel Co., Inc., 2207 Clovis Road, Lubbock, Tex., for details on polished-rod adjuster.**

●

Guide Shoe Made For Offshore Spudding

The guide shoe is butt welded to a 220-ft. string of casing and operated from a crane barge. It uses the jetting action of water, forced at 400 psi. through holes in the aluminum nose, to speed drilling of the conductor-string hole through silt. The maker reports one operator using the guide shoe penetrated 120 ft. of sand in 53 minutes.

The guide shoe has a rib-reinforced aluminum nose. It can be drilled out readily when you reach the desired depth. The water forced through holes in the nose provides a jetting action that reportedly eliminates the problem of packing sand

Water is pumped into the casing through three 2½-in. hoses. Sand and silt packing back around the casing are said to eliminate the need to cement the string. **Write or call: Rector Well Equipment Co., 1100 North Commerce Street, Fort Worth, for details on 30-in. guide shoe.**

●

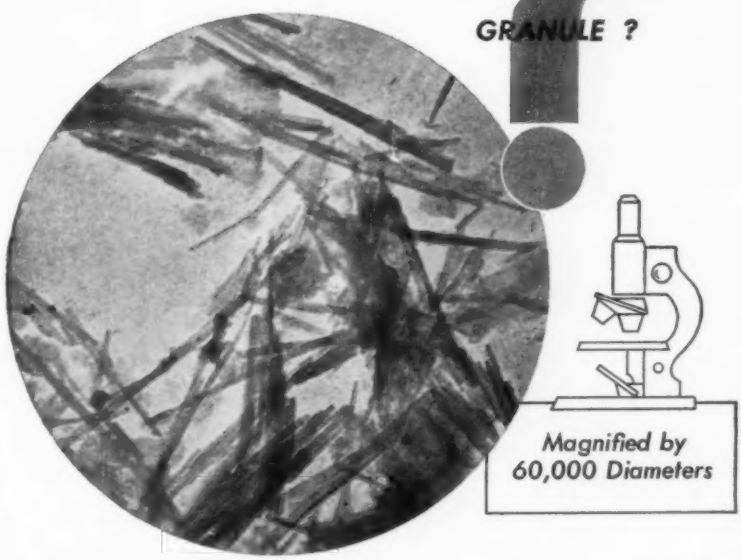
Cooling Tower Features Low Silhouette

Capacities are available from 75 tons up in this new Lo-Line cooling tower. It features all-steel structural members. These are hot-dipped gal-

EVER LOOK INSIDE A

Florex ?

GRANULE ?



The fibrous nature of Florida Fullers Earth, commercially available as Florex, reveals each unit consisting of about 2200 molecules in a bundle, providing ready selectivity in adsorption of color and contamination from organic and inorganic liquids and gases.

Florex quality means specially processed fullers earth giving maximum surface area and adsorption efficiency. Florex is unequalled in high quality or low cost for processes involving the use of highly active clay for sweetening light distillates, dehydration, desulfurization, and polymerization.

Standard meshes from 2/4 to 200/up and our experienced adsorption specialists are available to help you solve complex laboratory or production problems.

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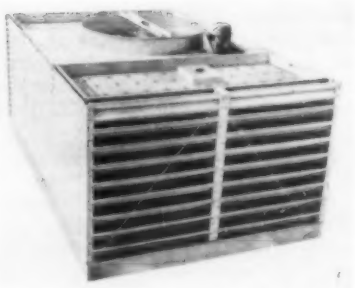
SHOWCASE . . .

New Equipment

vanized after fabrication for corrosion protection. Louvers, casing, distribution system, and fan deck are asbestos cement.

The cooling tower is designed specifically to conform to standard metropolitan fire codes. Through its low profile and uniform exterior treatment, the tower compliments architectural design. Heart-grade redwood is used in the deck fill and drift eliminators to achieve long, trouble-free



service. **Write or call: J. F. Pritchard & Co. of California, 4625 Roanoke Parkway, Kansas City 12, Mo., for Bulletin 5.2.902.**

7 1/2 lbs.

of PRECISION pipe cutting & beveling

By consistently meeting exacting shop requirements and rugged field duties, the H&M Model "O" again and again proves itself, the pipe fabricator's indispensable tool for . . .

SMALL DIAMETER WORK: The Model "O" was the **first** pipe cutting and beveling machine specifically designed and manufactured to handle 1½" to 4" pipe.

ACCURACY: Factory tested to minute tolerances, the Model "O" will literally "crank out" perfect cuts and bevels that are required for high quality work.

SPEED: Simply mount the machine on pipe, light the torch, give the handle a few quick turns, and a perfect bevel has been made.

ECONOMICAL USE: Due to the simplicity of the Model "O", your most inexperienced (and inexpensive) workman can become an expert operator with only a few minutes instruction. Plus — the first cut is perfect, (even when cutting saddles, tees, ells, etc.) — no costly recuts are necessary.

For heavyweight action by a lightweight beveler, contact H & M, the world's leading supplier of pipe cutting and beveling machines and attachments.

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PIPE BEVELING MACHINE COMPANY

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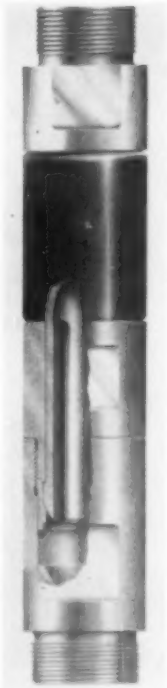
TULSA, OKLAHOMA

Top Seal For Pumps Seals Off Sand, Scale



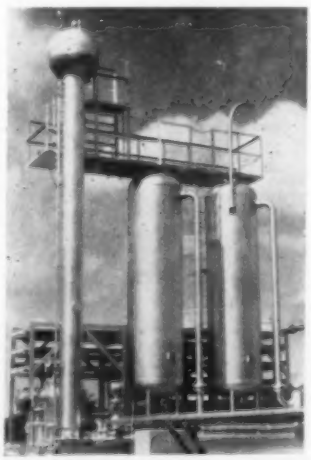
The new top seal is mechanical in operation. It can be applied to any conventional bottom-lock pump. Insert it between the top insert collar and the rod-guide cage. The top seal is designed to seal off sand, scale, or other undesirable residue which usually forms around the seat of a bottom-lock pump. Thus it makes pump removal simple and eliminates most stripping jobs, the maker says.

A seating nipple is not needed. Any length of pump can be run. The seal serves as a stabilizing element at the top of the pump. It prevents radial movement and so prolongs the pump's service life. Pressure between the bottom lock of the pump and the top seal can be easily equalized. **Write or call: Page Oil Tools, 3356 Lime Avenue, P. O. Box 7097, Long Beach, Calif., for details on top seal.**

●

Packaged Plant Ups Distillate Gas Recovery

The Delta Dryex recovery unit operates on an adsorption principle and features accurate electronic controls.



NOT EVEN FIVE FEET OF PEAT BOG CAN HANG UP THE NO. 583

The Cat* No. 583 Pipelayer is not only the highest capacity pipelayer in history—but the most efficient. Mannix Ltd., Calgary, Alberta, has four of them in its 100% Caterpillar spread laying 110 miles of 30-inch gas line through southern British Columbia.

The line takes the No. 583s through 40 miles of reclaimed lake bottom, covered with heavy silt and peat bog four to six feet deep. But the No. 583 has a full 21-inch ground clearance, and the bog can't stop it.

These big yellow units were engineered to give you a full day's work no matter what the terrain. For this machine was designed after consulting spread superintendents, foremen, mechanics and operators throughout the industry. It incorporates all their ideas of the ideal pipelayer. As a result you have the first machine that is *all pipelayer*.

It has 130,000-lb. lifting capacity and its engine delivers 191 HP. There is a three-stage torque converter in the main drive and new hydraulically actuated counterweights. And the extra high bottom clearance of the counterweight pivot, coupled with the ability to retract the counterweights well over the tracks, means that the No. 583 can maneuver easily even while handling an extra heavy load on a narrow right of way.

Here's the safest, fastest, most efficient machine ever designed for pipelaying. Behind it stand an army of Caterpillar Dealers always ready to give you quick service with quality factory parts wherever the pipe takes you. Call your Caterpillar Dealer today. You name the date—and he will demonstrate on *your* job.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

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WANTED—
THE HARD WORK

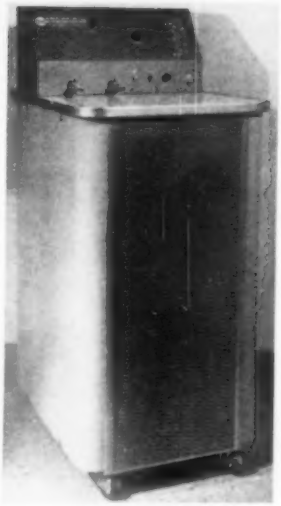
However, pneumatic controls are available. For high recovery capacity, a stabilizer tower is incorporated in each Dryex unit. This equipment stabilizes the lighter, or so-called "wild," ends in a natural-gas stream and enables a more thorough recovery of liquids in the stream.

In addition to the stabilizer with product cooler, the packaged recovery plant consists principally of: (1) two vertical adsorption towers, (2) an atmospheric cooler, (3) heat exchanger, (4) product accumulator, (5) direct-fired gas heater, and (6) gas pump. Electronically controlled or pneumatically operated valves channel the gas stream through first one tower and then the other. **Write or call: Delta Tank Mfg. Co., Inc., Baton Rouge, for details on Dryex recovery unit.**

●

Coolant Source For Petrochemical Labs

Completely self-contained, the new coolant source provides a recirculating flow on specified coolant at any temperature between 5° and 95° C. with a temperature regulation at the output fitting of ±0.03° C. Suited for precise temperature control of



water-jacketed polarimeter tubes and refractometers, the system provides a continuous coolant flow rate of 1 g.p.m. at a 5-ft. head and a thermal heat-exchange capacity from 350 watts heating to 350 watts cooling.

Made of glass fiber and steel, the console is equipped with a table top for instrument or apparatus. Both the inlet and outlet and all controls and indicators are mounted on an elevated cabinet for ease of operation.

Large diameter, locking type of casters allow easy mobility without impairing the console's usefulness as a laboratory bench. Equipped with a three-wire cord, the device requires 117-volt, single-phase, 60-cycle, a.c. power. Maximum power consumption is 1,200 watts. **Write or call: Research Mfg. Corp., P. O. Box 6056, San Diego 6, for detail on coolant source for petrochemical labs.**

●

Meter Takes Readings at Any Set Time or Point

The "memory meter" retains indefinitely a reading taken at any desired instant, the maker reports. It is suitable for use where readings at a given

Less Breakage at Low Temperatures
COSTS LESS ON THE PIPE
Less Breakage Near Roll Core
Less Breakage From Quick Starts
Normal Curves At Straight-line Tension

PERRAULT 15 lb. FELT Glass Fibre Reinforced

also... Glass, Asbestos and Kraft Wrap . . . Rock Shield . . . Coating & Wrapping, Cleaning & Priming Machines . . . Tar Kettles, Patch Pots, Burners & Accessories . . . Pneumatic Inside Line-up Clamp . . . Pneumatic-tired Lowering-in Cradle . . . Pipe Cradles . . . Tongs, Sling Belts, Hooks, Clamps, Hand Tools, Supplies and Equipment of Every Sort.

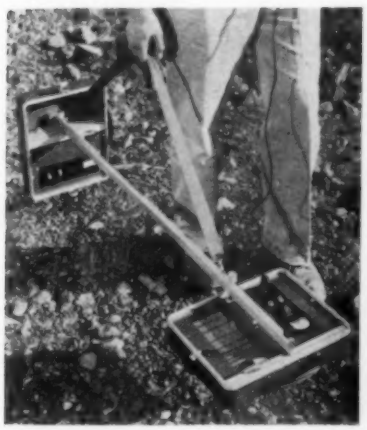
Perrault fifteen-pound asbestos pipe wrap is reinforced with longitudinal glass fiber strands at one-fourth inch spacing. It costs no more delivered to the job, but by eliminating most shut-downs due to breakage, it costs far less on the pipe. Since it is not brittle when cold. Perrault reinforced felt is especially recommended for Fall and Spring Projects where material will be kept in unheated storage. Let us show you a sample and quote your next job. We also offer the best in other pipe wraps: Owens-Corning Glass, Kerr-McGee Outer Wrap, Kraft, and the original Rock Shield.

PERRAULT EQUIPMENT COMPANY
1130 N. BOSTON — TULSA, OKLA. — TELEPHONE LUther 5-1103

time must be known but cannot be noted immediately. Readings may be taken at any point on the meter scale —not necessarily at the maximum reached by the signal.

The memory meter is available in sensitivity ranges from a few microamperes or millivolts to 50 amp. or 500 volts, d.c. or a.c. It is built on a 4½-in. rectangular plastic case, which looks like a conventional API panel meter from the front. **Write or call: Assembly Products, Inc., Chesterland, Ohio, for details on "memory meter."**

●



Pipe Detector Is Transistorized

Easier pipe finding and leak detecting is assured through use of transistors in this M-Scope combination pipe finder-leak detector, the maker reports. Besides transistors, printed circuits, glass-fiber cases, and single-turn, solid-aluminum detecting loops are used.

Transistors are said to give exceptional battery economy. Battery life in the new detector is estimated to be 1,500 hours at continuous operation. Other new detector features include: (1) a simplified operating procedure, (2) built-in battery testers, (3) power selection control, (4) detachable carrying belt, and (5) complete illustrated instructions. **Write or call: Fisher Research Laboratory, Inc., Palo Alto, Calif., for details on transistor pipe finder-leak detector.**

●

Manual Valve Is Easy to Operate

The new manual shutoff valve Model 949T for high-pressure gas systems features easy operation. The threads are above the seal and out of the fluid stream.

Positive leakproof shutoff is achieved by a resilient O-ring. The O-ring is withdrawn completely and automatically from the fluid stream when the valve begins to open. Throttling is then accomplished by a conical metal plug which varies the orifice area.

The O-ring is not required to pass a port or other diametral relief or constriction which might damage its surface. Rated at 0 to 5,000 psi., the valve can be used in either hydraulic or pneumatic service. **Write or call: Circle Seal Products Co. 2181 East Foothill Boulevard, Pasadena, Calif., for details on manual shutoff valve.**

Diaphragm Valve Is Chemical-Resistant

This new plastic-diaphragm valve operates at 300° F. temperature with a chemical resistance approaching that of glass, the maker reports. It was developed to meet the requirements for a plastic valve that features high temperature resistance (up to 300° F. at 50 psi.) with excellent chemical resistance and dimensional stability. Sizes range from 12 through 2 in. with screwed ends. **Write or call: Hills-McCanna Co., 4606 West Touhy Avenue, Chicago 30, for Bulletin 101.**

PLASTIC COATING
HOLIDAY
DETECTOR

MODEL
LS-1

ECONOMICAL, HIGHLY PORTABLE, FIELD INSTRUMENT FOR USE IN TAPE COATING HOLIDAY DETECTION

DEPENDABLE, SAFE ON WRAPPINGS
This detector will locate pin-holes and bare spots in plastic tape applications such as polyethylene, etc.

EASILY PORTABLE
Hand-held instrument weighs but 3¾-lb. Easily inspects applications on field joints, service tees, valves and fittings. Not recommended for pipelines.

AUDIO SIGNAL
When the low energy spark locates a perforation through tape wrapping, spark sound is amplified by a speaker inside the unit. Unit has insulated plastic case and handle.

SILICONE-RUBBER ELECTRODES
Pliable silicone-rubber electrode 3½-in. wide can't injure wrappings yet conforms to surface contours, gives accurate check. Other width electrodes avail.

LS-1 DETECTOR COMPLETE CONSISTS OF:
Detector in plastic case with 6-volt, dry-cell battery. Electrode assembly with 3½-in. wide silicone-rubber blade. Ground wire cable 4-ft. long. Carrying case.

Write for literature . . .

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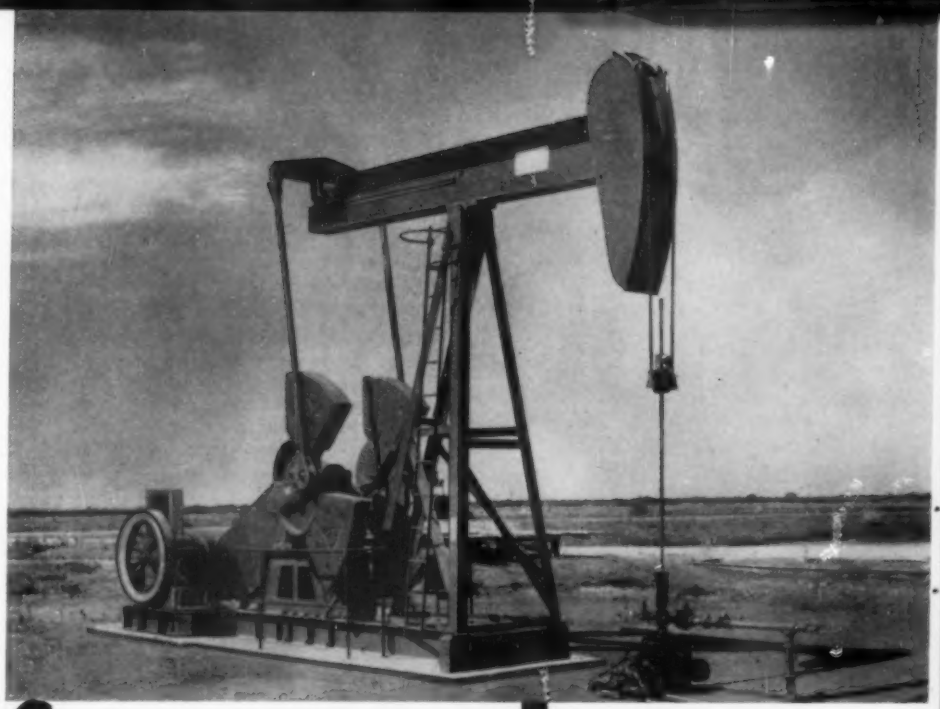
* Office only. No stock at these points.



for complete production harmony

GO CONTINENTAL-EMSCO worldwide

Steady, sure pumping power..electrically or with gas..

C-E GREEN TRIANGLE ELECTRIC PUMPING MOTORS

An *exclusive* built-in BALANCE METER on these motors makes it possible to see *at a glance* if your well is counterbalanced.. pumping steady, sure, economically. C-E Green Triangle Motors have 5-8% slip.. 275% starting torque.. 40° C rise with a *guaranteed* 1.15 service factor. These features give cushioned peak demands and added protection to gears, belts, bearings, well equipment, and can reduce current demands. Double shaft extension and rotation in either direction make these motors easy to install.

C-E PUMPING ENGINES

Completely weatherproof, C-E engines are doing a real pumping job throughout the world in hot, cold, wet and dry climates. These engines are easy to start.. simple to operate. Major items such as wet-type cylinder sleeves, valves, valve guides and inserts can be replaced in the field.. adding years and years to engines' pumping life. Many component parts can be adjusted or installed in unit assemblies, which greatly reduces maintenance.. costly downtime.

.. Equipmen

You're Money Ahead with C-E

Steady, sure,
low-cost production
with

CONTINENTAL-EMSCO UNIT PUMPERS

The wide size range of Continental-Emsco API Unit Pumpers makes it possible to apply a unit that will handle your individual well requirements at the lowest possible cost. Low cost, because you're assured of correct recommendations and installation. Low cost, because C-E Unit Pumpers are *Engineered* . . not just built.

C-E Unit Pumpers are equipped with patented counterbalances. This makes it possible for one man to counterbalance a well safely . . at ground level.

Engineered . .
Not Just Built

Don't forget

GREEN TRIANGLE V-BELTS

. . in matched sets

Why V-belts in matched sets? Because with matched sets you get *uniformity* of size . . material . . freshness . . tension . . for a dependable power hook-up.

GREEN TRIANGLE V-belts . . made by the New York Belting and Packing Company . . are especially matched in sets . . and especially designed to meet the gritty, oily, day-in and day-out conditions of oil field pumping.

Don't neglect this *vital link*. Insist upon GREEN TRIANGLE V-belts for steady, sure pumping. Always available through your nearby Continental-Emsco stores

nt that Hums

-E on Both Installation and Operation

Your D+B man has the answer to your bottom hole pump problems

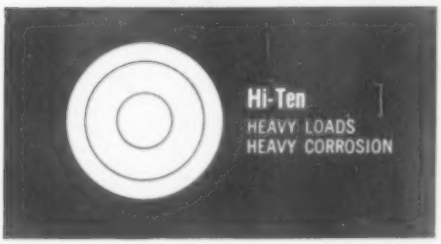
Whatever the well condition, your Continental-Emsco D+B specialist has a pump for lower lifting cost. In problem wells, he can analyze well conditions and suggest materials, parts and pump design to reduce costly pulling jobs. His recommendations are based on day-by-day experience, a working knowledge of the field he serves, and complete service records of D+B pumps operating in the area. He will pick up your pumps in the field and see that they are properly repaired in our fully equipped pump shops . . manned by company trained repairmen.

For high quality pumps and replacement parts . . at competitive prices . . see your D+B man and be assured of steady, sure production.

HEAVY

for Service

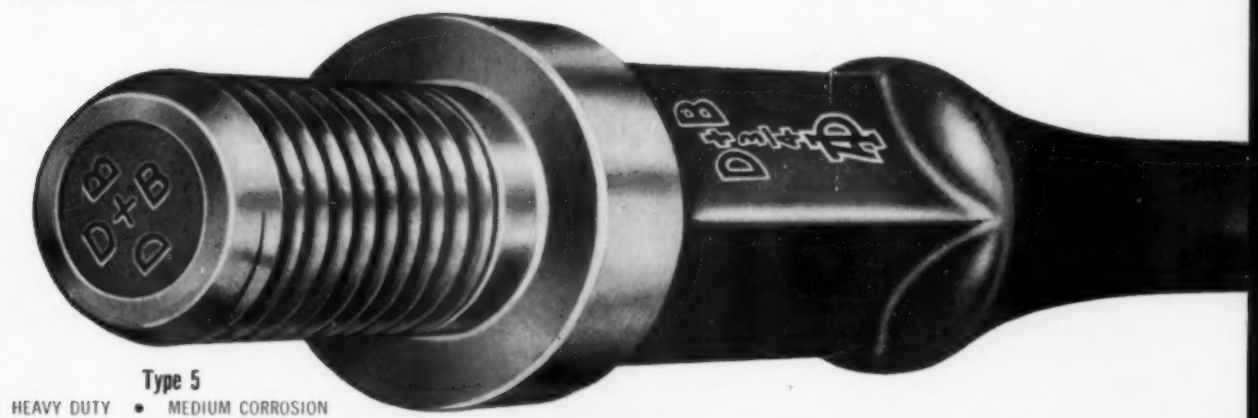
ask a D+B man . . .



Stopping rod failures before they start is the business of your D+B man

When planning to place a well on the pump, your Continental-Emsco D+B representative is the man to see. He can recommend the grade of sucker rod for every well condition . . often solving many problems at lower cost to you.

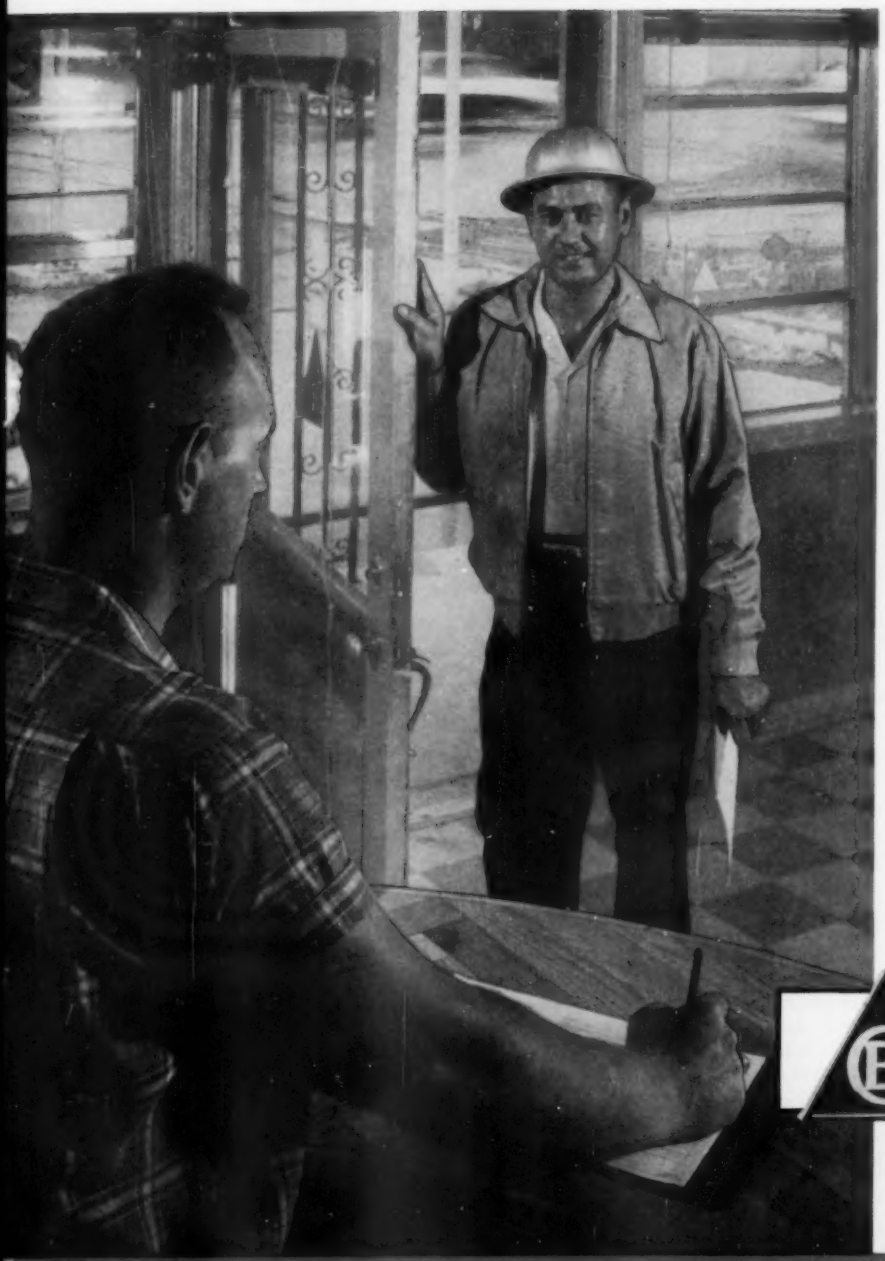
Car load or single string orders are quickly dispatched from ample store and warehouse stocks located throughout producing areas. This assures a dependable supply of rods close to your wells. Continental-Emsco field engineers stand ready to see that the right sucker rod string is installed for trouble-free pumping.



Type 5
HEAVY DUTY • MEDIUM CORROSION

e that Sings..

...Just ASK a D+B man



"Walt, here's my problem . . "

This field superintendent had a problem . . maybe large . . maybe small. But you can be sure he found a solution at his Continental-Emsco store. These *complete supply stores* are fully stocked and manned by capable personnel . . ever concerned with your problems.

Continental-Emsco stores have the supplies, tools and equipment to do your job better. Drop in anytime . . see what we have in stock . . see what's new. Make it a habit to buy . . *in person* . . at your Continental-Emsco store.

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Serving the Oil and Gas Industries ... Worldwide

CONTINENTAL-EMSCO COMPANY • A Division of The Youngstown Sheet and Tube Company General Offices: Dallas, Texas • Export Division: 45 Rockefeller Plaza, New York, N. Y. Continental-Emsco Company Limited • General Offices: Calgary, Alberta, Canada Continental-Emsco Company C.A., Caracas, Venezuela • Plants: Los Angeles • Houston • Garland, Texas • Representatives in All Principal Oil Fields of the World

..Go CONTINENTAL-EMSCO

P726R

On land . . . or sea

You can get uniform mud in seconds

CHANGE MUD IN SECONDS with one or two of these LIGHTNIN Mud Mixers. Their big rotating turbines create a powerful mud flow, sweeping every corner of your tank or pit. Your mud is kept uniform, all of it ready for instant use.

On offshore drilling tenders—on the world's deepest holes—all up and down the oil country, drilling men are getting an *immediate* rise in mud weight whenever they want it.

You can condition mud this same fast way by installing LIGHTNIN Mixers in your tank or pit. With LIGHTNINS on the job, you get immediate dispersion of weight and gel additions. Heavier, thicker mud is yours the moment you want it.

Mud stays uniform

One or two LIGHTNIN Mixers keep the mud uniform, too—every gallon the same weight and viscosity. Large turbine impellers set up such a strong, steady flow that mud just can't settle out.

Unconditionally guaranteed

You take no risk when you choose LIGHTNIN Mixers for your drilling mud. Every LIGHTNIN is guaranteed, unconditionally, to do the mixing job for which it is recommended.

LIGHTNINS are fast becoming standard equipment on offshore drilling barges and in land tanks and earthen pits, too.

Seeing is believing

Tell your LIGHTNIN sales engineer or supply company representative you want to see for yourself how good LIGHTNIN mud control really is. He'll arrange a visit to a rig in your area where LIGHTNIN Mixers are at work.

You'll find his name listed in the Composite Catalog. Contact him right away—or write us direct.

FOR QUICK FACTS on LIGHTNIN mud control, send us a card today requesting free illustrated Bulletin B-502.

Lightnin® Mixers

MIXCO fluid mixing specialists

MIXING EQUIPMENT Co., Inc., 174-d Mt. Read Blvd., Rochester 11, N.Y.

In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Avenue, Toronto 10, Ont.

SHOWCASE . . .

New Literature

Job-site safety . . .

program requirements on construction projects are outlined in a new 16-page booklet. The booklet tells how to organize a safety committee, how to indoctrinate new employes, and what medical arrangements to make. It tells how accidents should be reported and investigated, what fire precautions should be taken, and suggests a schedule for safety inspections. Suggestions are given for the use of films, posters, and other visual aids to promote safety on the job. **Write or call: National Constructors Association, 50 East Forty-first Street, New York, for On-The-Job Safety booklet.**

Wrought-iron conduit . . .

approved by Underwriters Laboratories reviewed in a new eight-page booklet. Wrought iron's composition and a description of the added corrosion protection provided by the sherardizing method of galvanizing and MCW-1 acid-resistant vinyl-enamel processing are discussed in the bulletin. Dimensional and weight data on wrought-iron conduit ranging from ½ to 6 in. is arranged in table form. Tables give the conduit's outside and inside diameter, wall thickness, threads per inch, and minimum weight per hundred feet. Information is also provided about couplings and 90° elbows. Separate tables list maximums of wire fill in rewiring existing raceways with types R, RH-RW, RHW, T, and TW cable and for new work with types R, RH-RW, RHW, and TW cable. **Write or call: National Electric Products Corp., 2 Gateway Center, Pittsburgh 22, for Wrought Iron Conduit bulletin.**

Air and steam cleaners . . .

are described in new four-page Bulletin 502. A description and cutaway drawing shows how these cleaners operate without the use of moving parts, filters, or baffles. This prevents clogging and loss of pressure, and eliminates maintenance problems as the unit remains clean, the maker says. Called Hi-eF Model LC purifiers, these units are installed like a pipe fitting on compressed-air lines. They are also used on small steam lines to prevent moisture and other pipeline entrainment. Selection tables show the recommended sizes of the steam and air cleaners to install at various air, gas, and steam flows. Specifications, prices, piping hookups and details, and other technical data necessary for siz-

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cathodic protection
offers
EXPANDED LINE

HEADER CABLE TAPS

Type TPS Connections are used to connect a tap cable #8 - #4 to a thru cable #6 - 2/0.

GROUND ROD TAPS

Type TGR Connections for #6 - 2/0 cables to ½" - ¾" ground rod.

GROUND ROD THRU

Type TGT Connections for #6 - 2/0 cables to ½" - ¾" ground rod.

Also expanded are conductor listings up to and including 2/0 for: Anode, Header, Test and Structure Leads to horizontal and vertical steel pipes and flat surfaces.

Write today for your New Catalog

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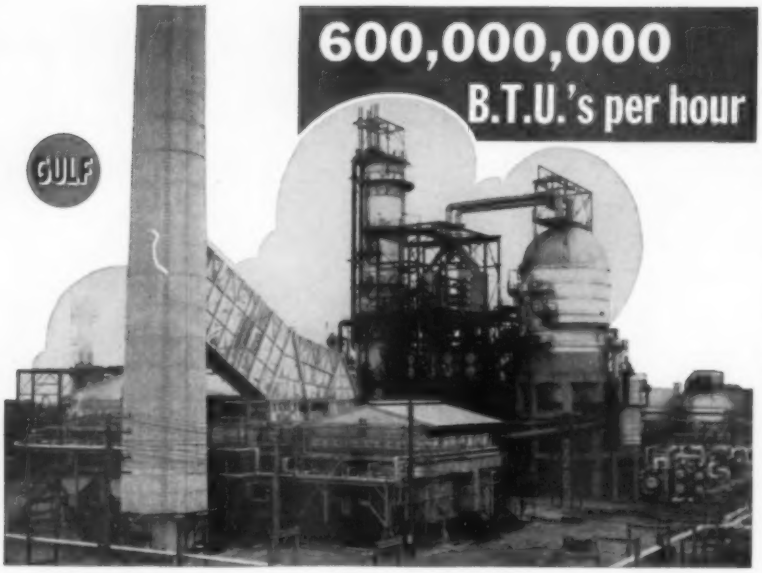

Forty-eight NATIONAL AIROIL Tandem Units fire Gulf's huge Crude Heater at Philadelphia.

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Exclusive TANDEM COMBUSTION UNITS

This tremendous Combination Atmospheric—Vacuum Crude Heater at Gulf Oil Corporation's Philadelphia Refinery, was constructed by Foster Wheeler Corporation . . . for a total burner liberation of up to 600,000,000 B.T.U.'s per hour.

NATIONAL AIROIL *exclusive* Tandem Combustion Units achieve this capacity with maximum economy and availability.

These NATIONAL AIROIL oil burners are *all-alloy* for burning high temperature pitch separately, or in conjunction with non-aerated gas burners. Additional burners are also provided for waste gas disposal.

NATIONAL AIROIL Tandem Units are recognized as standard firing equipment in oil refinery and chemical plant heaters throughout the world. They are noted for versatility regarding fuels; and insure correct flame placement so necessary to avoid damage to the heat-absorbing tubes. Your furnace maintenance problems are measurably reduced, and hours on stream greatly increased by use of Tandem Combustion Units.

Further information sent upon request on your letterhead.

OIL BURNERS and GAS BURNERS for industrial power, process and heating purposes; STEAM ATOMIZING OIL BURNERS; MOTOR-DRIVEN ROTARY OIL BURNERS; MECHANICAL PRESSURE ATOMIZING OIL BURNERS; LOW AIR PRESSURE OIL BURNERS; GAS BURNERS; COMBINATION GAS and OIL BURNERS; AUTOMATIC OIL BURNERS, for small process furnaces and heating plants; FUEL OIL HEATERS; FUEL OIL PUMPING and HEATING UNITS; FURNACE RELIEF DOORS; AIR INTAKE DOORS; OBSERVATION PORTS; SPECIAL REFRACTORY SHAPES.

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Southwestern Division: 2512 South Boulevard, Houston 6, Texas

INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT

ing and installing these cleaners are included. **Write or call: V. D. Anderson Co., Div. of International Basic Economy Corp., 1935 West Ninth Street, Cleveland 2, for Bulletin 502.**

Heating coil . . .

is described in new four-page Bulletin 258. The product takes the place of pipe coils for heating and cooling processes, the maker says. Two metal plates, embossed and welded together, form the flow channels. The bulletin gives design and price information. It also tells how to do your own estimating. A variety of metals can be used to make the coil. Length and width variation, handles and hanger brackets, surface treatment, and zinc metalizing are discussed. Edge-sealing weld, closed cylinders, half-couplings or pipe nipples, and data for replacing pipe coils are also presented. **Write or call: Dean Thermo-Panel Coil Div., Dean Products, Inc., 616 Franklin Avenue, Brooklyn 38, N. Y., for Data Bulletin 258.**

Dust-collection equipment . . .

is detailed in new six-page Bulletin A-9157 now available. The bulletin describes and illustrates wet and dry type of dust collectors and auxiliary equipment. These include cyclones, centrifugal and dynamic washers, dust and fiber filters, discharge gates, and trickle valves. Applications include rotary drying, pulverizing, grinding, spray drying, and other processes using finely divided solids. Data on two new auxiliary units are included in the bulletin. One is a two-door discharge gate for all dry flowable materials, particularly those of an abrasive nature, or for products where minimum breakage to individual particles is required. The other is a trickle valve, which uses gravity for automatic operation, with no auxiliary power required. **Write or call: Ducon Co., 147 East Second Street, Mineola, N. Y., for Bulletin A-9157.**

What to know and look for . . .

when selecting diesel engine fuel is outlined in a new 16-page illustrated booklet. Entitled "Fuel Oil and High-r.p.m. Diesel Engines," the booklet applies to all makes of diesels which operate between 1,200 and 3,000 r.p.m and are used in such applications as trucks, earth-moving equipment, pumps, drilling rigs, air compressors, boats, and generator sets. The booklet points out the effects of various grades of fuel on diesel-engine life and performance. It includes a fuel-selection chart to assist engine owners and op-

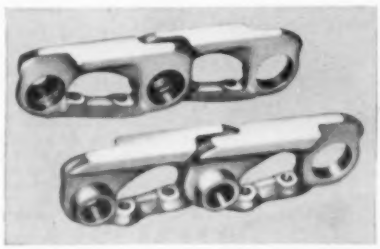
PRETESTING STEEL IS ONE WAY MATCHLESS QUALITY IS ASSURED IN GENUINE CATERPILLAR PARTS

Careful selection of material gives greater strength to new D8 strutless track links

Quality doesn't just happen. The world-famous quality that is the hallmark of Caterpillar earthmoving equipment is a direct result of never-ending research, the finest possible materials, and persistent attention to every manufacturing detail. This is true of Caterpillar machines. And it is true of Caterpillar parts.

The new, strutless link for Cat D8 Diesel Tractors is an example of this emphasis on quality. Each link is able to bear the entire weight of the tractor, over and over again, in the roughest of terrains and climates. This is how Caterpillar makes sure these links meet this challenge:

All steel used for links is given an extensive series of tests *before* manufacture. In the Caterpillar Metallurgical Laboratory it is first analyzed for chemical composition by a spectrograph—slight variances in chemical make-up can result in big differences in the finished product. Then the steel is tested for hardenability; in other words, the degree to which it will respond to heat treating. Resistance to impact loads is measured to insure the track link will give maximum performance under all conditions. Steel that cannot be made into Caterpillar quality links is rejected.



New, strutless link for Caterpillar D8 Diesel Tractors.

The new D8 link is forged—the best way to make a link. Forgings are more dense. They have "inner flow lines"—the equivalent of grain in wood—following the contour of the part, providing greater strength at critical locations as well as resistance to breakage.

"Dubbed-off" link ends eliminate damage to rollers and mating links. Strategic designing of steel into the bushing boss and arch improves fatigue strength. Links are *double* heat treated, furnace heated for a tough core, and "Hi-Electro" hardened for a deep, superhard rail surface.

Features like these mean one thing. A Caterpillar part is your best buy. Your Caterpillar Dealer has full information on the new D8 strutless links and the other quality Cat parts. See him today.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

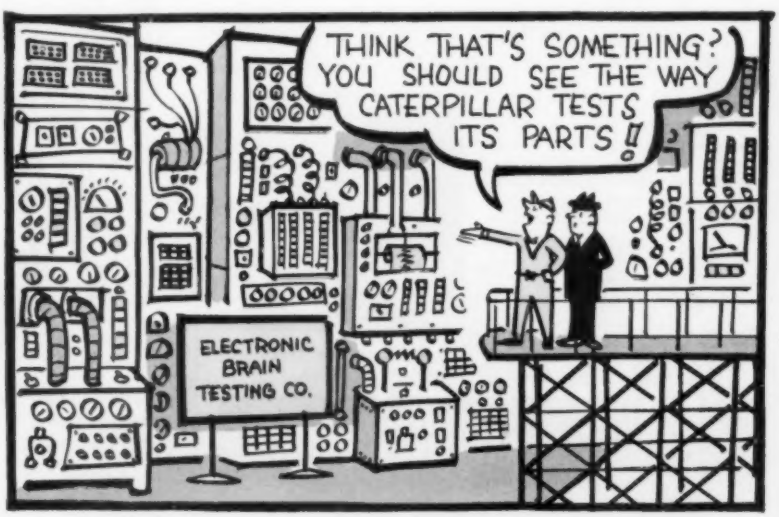
SERVICE TIP

For maximum life, tracks should have 1½" to 2" of slack. Your Operation and Maintenance Instructions have complete adjustment details.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

LINK-STRENGTH is measured on this hydraulic press. The design of Caterpillar track parts is under constant examination by the most extensive research facilities in the industry.



SEALTIGHT® PIPE SHIELD

. . . The practical answer to PERMANENT PROTECTION against all ROCK DAMAGE!

Effective "holiday-free" pipe protection

Sealtight Pipe Shield provides an easily workable protective shield for pipes in every type of terrain or installation. It is the one completely effective and economical answer to "holiday-free" pipe shielding . . . eliminates the expense of dirt padding. Penetration tests show that even large rocks fail to rupture this material. Ideal for protecting pipe sections pulled across swamps . . . replaces ineffective, costly wooden slats or snow fence materials in shielding coated pipes at river crossings and under river clamps. Sealtight Pipe Shield is impervious to stress and strain of soil movements—unaffected by soil chemicals and moisture. Records of on the job tests prove Sealtight Pipe Shield far more effective and less costly than ditch padding installations.

EASILY APPLIED

Sealtight Pipe Shield is quickly and easily installed by untrained crews. The necessary straps, tools and seals are available and can be shipped as a complete package when desired.

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W.R.MEADOWS, inc.

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VALLEY

LIGHTWEIGHT

STEEL PIPE

Manufactured in new, modern continuous mills to specifications per ASTM—A139 Grade B; which also conforms to API 5L standards. Automatic electric butt welded process, using CO_2 gas. Pressure tested. Ideal for use as line pipe for gas and oil, for municipal water systems and irrigation, high velocity tubing for air conditioning and heating, heat exchangers, well casings, grain and mineral spouting, mining, signs, as well as many other manufacturing and industrial uses.

Available in 6", 6⅝", 8", 8⅝", 10", 10¾", 12", 12¾", 14", 16" diameters; from 14 gauge up to and including .219 wall thickness; 20, 30 or 40 foot lengths; in plain or belled ends. Quotations available for Victualic or Dresser end processing, and coating and wrapping.

Available for immediate delivery

VALLEY Manufacturing Company Valley, Nebraska

Write or call for full specifications and production data to: Steel Pipe Division.

So, we've gone west!

Now you will find a complete MURPHY shop in California. We have opened an office and shop at 11812 Davenport Road, Los Alamitos, in the Los Angeles area.

You'll find every MURPHY Switch and Valve for all Engine-powered or Electric Motor-powered pumps. For Safety shutdown . . . alarm . . . Automatic Operation.

MURPHY can furnish switches to suit your exact requirements. Write for information stating specific problems.

WESTERN OWNED AND WESTERN OPERATED

MURPHY SAFETY SWITCH OF CALIFORNIA
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LOS ALAMITOS,
CALIFORNIA

FRANK W. MURPHY MANUFACTURER, INC.
RANCH ACRES STATION
TULSA, OKLAHOMA

erators in selecting the type of fuel that will result in the most satisfactory operation of their engines. **Write or call: Detroit Diesel Engine Div., General Motors Corp., Detroit 28, for Diesel Engine Fuels Bulletin.**

New vertical-boom addition . . .

to Barber-Greene Co.'s ditcher line—Model 784—is a crawler-mounted machine described in a new 16-page, 2-color booklet. One feature described in the bulletin is a dual range, all-hydraulic crowding transmission. A flexible draw-bar system reduces strain and twist on the digging boom when the machine digs in uneven ground or traverses a curve, the maker reports. A new type of bucket-line drive, eliminates long wrap-around drives and equalizes contact to each side of the boom. **Write or call: Barber-Greene Co., 400 North Highland Avenue, Aurora, Ill., for Model 784 Vertical-Boom Ditcher folder.**

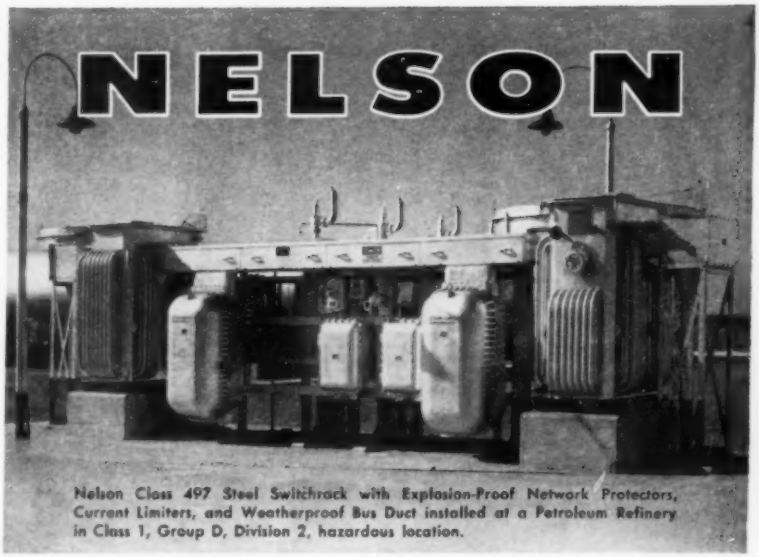
Diaphragm seals . . .

designed to protect pressure instruments against corrosion and clogging are described in new Bulletin 250. The seals feature honed metal-to-metal sealing surfaces with no gaskets or O-rings and no internal threads or blind taps. They also have an overrange protection to 2,500 psig. Only a wrench is required for assembly or disassembly. Types of seals available and materials of construction are detailed in the bulletin. **Write or call: Brooks Rotameter Co., Lansdale, Pa., for Bulletin 250.**

Glass pipe . . .

and fittings are reviewed in new Catalog SG-11. The pipe may be used at operating temperatures to 250° F. without special precautions. If precautions against thermal shock are taken, it may be used at temperatures as high as 450° F. It is also said to be suitable for pressures to 100 psi. For extremely hazardous conditions, armored pipe and fittings are available in all standard sizes. Pipe sizes of ¼, ⅜, ½, and ¾ in. inside diameter are available in nine stock lengths from 6 to 72 in.

The catalog also shows detailed diagrams on the firm's stock fittings including elbows, tees, crosses, U-bend, laterals, reducers, and high-pressure stopcocks. Also shown are Teflon gaskets in solid and envelope styles, Teflon expansion joints, and quick-disconnect types of couplings for glass-to-glass and glass-to-metal coupling. **Write or call: Sentinel Glass Co., Hatboro, Pa., for Catalog SC-11.**



Nelson Class 497 Steel Switchrack with Explosion-Proof Network Protectors, Current Limiters, and Weatherproof Bus Duct installed at a Petroleum Refinery in Class 1, Group D, Division 2, hazardous location.

THE ***dependable name for electrical control equipment in the petroleum industry.***

When control equipment is specified for Class 1, Group D, hazardous locations investigate NELSON . . . first. Be guided by 20 years of engineering and manufacturing experience that assures you of getting the highest quality, easiest installed electrical equipment.

For safe, dependable products, and personalized service, call your NELSON representative.

Among the explosion-proof products designed for Class 1, Group D, hazardous locations manufactured by NELSON are:

- CIRCUIT BREAKERS
- PANELBOARDS
- CONTROL STATIONS
- PIPE LINE SAMPLERS
- SWITCHRACKS
- MOTOR STARTERS
- CONTROL and TRANSFER SWITCHES
- JUNCTION BOXES
- HIGH-VOLTAGE MOTOR STARTERS

a major source of electrical control equipment for industry

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

ELGEN

fastest well logging in the field

Combined electronic-permalogging pin points pay zones fast!

Elgen's newest electronic logging equipment is engineered to pinpoint precision. Thin-zone production possibilities are accurately delineated ... more profits are realized from your well.

Write or call your nearest representative or the Elgen home office today. Elgen will be pleased to present complete information to show the many advantages to you when you use Elgen expert logging services.

Features:

- Lowest price schedules, minimum rig time. New improved equipment, most advanced techniques.
- Formation characteristics identified in detail. Strata boundaries accurately delineated.
- Structure-formation compared, correlated. Mud column effects reduced. Greatest accuracy in all formations.

THE **ELGEN** CORPORATION

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Shown at the joint conference of International Nickel and Metal Goods are: seated, Robert E. Grote, Jr., president of Metal Goods; H. T. Gregg, vice president and southern regional manager, Metal Goods; Scott Harrison, manager of Tulsa branch, Metal Goods; C. J. Bianowicz, manager, Inco nickel alloys sales, International Nickel; R. E. Reddell, sales department, International Nickel; standing: Harold Larsen, assistant to manager, primary nickel sales department, International Nickel; Sam D. Hodgdon, vice president and Dallas branch manager, Metal Goods; J. M. Weldon, assistant to vice president, International Nickel; Allen Whitehead, manager of nickel and nickel alloys division, Metal Goods.

Largest Nickel Supply to Benefit Oil Industry . .

according to J. M. Weldon, assistant to the vice president, International Nickel Co.

Weldon was speaking at joint meetings of executives of International Nickel and Metal Goods Corp. in Houston and Dallas.

"In 1961," Weldon said, "practically all of the new planned nickel production will be available and the free world will have between 650,000,000 and 675,000,000 pounds annually."

Harris T. Gregg, vice president and southern regional manager, said, "The news of the present day availability of nickel is of special significance to industry, because the high corrosion and heat resisting qualities of nickel and nickel bearing alloys are so essential to many operations."

In addition to Gregg, other Metal Goods representatives who attended the joint meeting were: Robert E. Grote, Jr., president; George P. Baumunk, vice president and northern regional manager; Sam D. Hodgdon, vice president and district manager of Dallas district; Allen H. Whitehead, manager of Nickel and Nickel Alloy division; G. H. Olsen, administrative assistant, Nickel and Nickel Alloy division; Gordon Meek, sales manager, Dallas; Scott Harrison, district manager, Tulsa; Grover Meek, district manager, Memphis, Tenn.; and Clark Brown, district manager, Denver, Colo.

Besides Weldon, Inco representatives included C. J. Bianowicz, manager, nickel alloys department; Harold Larsen, assistant manager, nickel sales department; and Robert E. Savage, in charge of distributor sales section of the nickel sales department.

Shareholders of Dresser Industries Elect Board . .

JOHN LAWRENCE

in their annual meeting. Named to the board were the following directors: H. N. Mallon, chairman of the board; Norman Chandler, Los Angeles, president and publisher, the Los Angeles Times; Henry P. Isham, Chicago, president of Clearing Industrial District, Inc.; Willard N. Johnson, Houston, president of Magnet Cove Barium Corp.; John Lawrence, Dallas, Tex., executive vice president, Dresser Industries, Inc.; L. W. MacNaughton, Dallas, board chairman, DeGolyer & MacNaughton; William A. McAfee, Cleveland, Ohio, senior partner, McAfee Grossman, Taplin, Hanning, Newcomer &

Kelite Corp. Develops In-Place Plant Cleaning . .

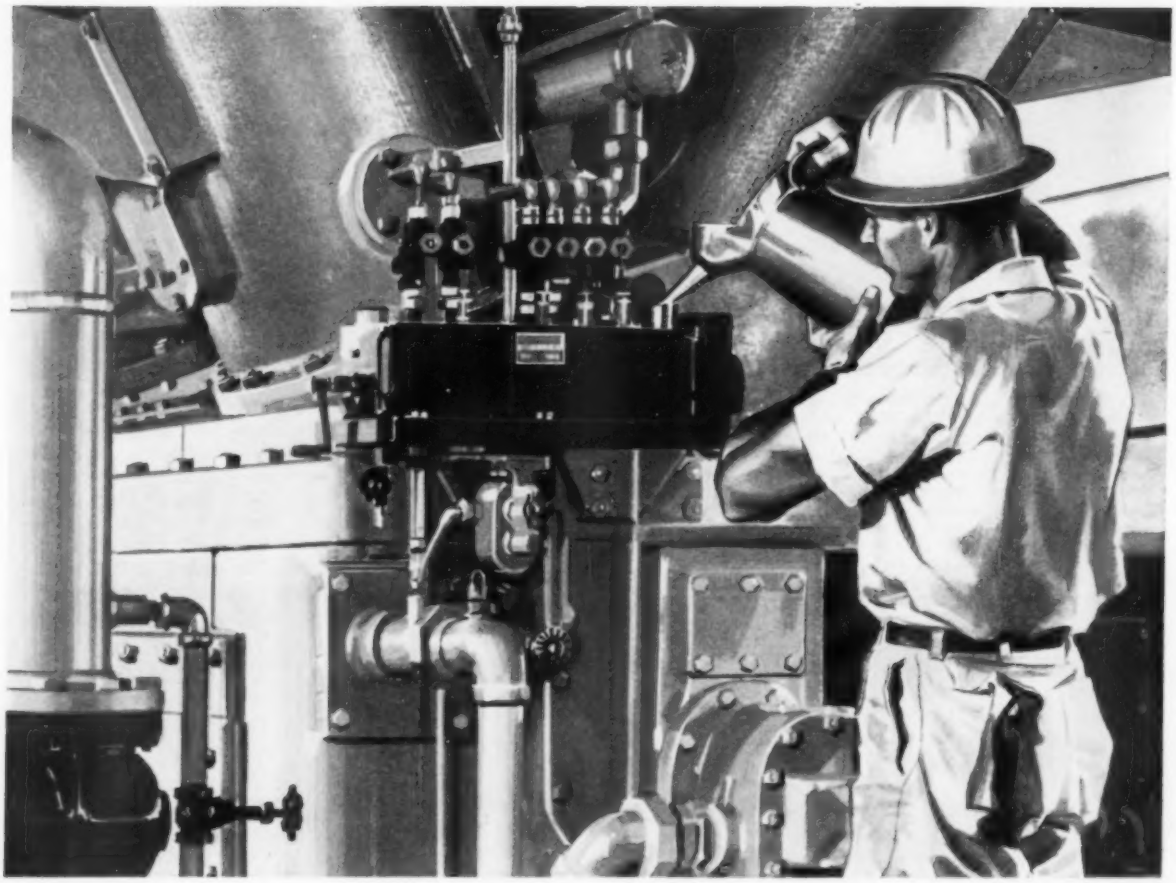
particularly for the product side of refineries and petrochemical equipment. The service provides chemical cleaners, developed specifically for the removal of product and coolant soils; technical manpower and supervision; and special auxiliary equipment, including mobile cleaning units, gas or oil-fired steam cleaners, fireless steam cleaners, and Powerblast units. The equipment is mounted on flat-bed tractor-trailers.

The chemical cleaners used include inhibited, corrosion-safe descaling compositions in liquid and powder form; solvent-alkali compositions for the removal of combinations of certain scales, sludges and cokes; solvent emulsions for oily soils, neutralizers, and steam and vapor cleaner products.

The equipment is available for outright purchase, lease-purchase, or lease by day.

To provide the service, Kelite has developed 2 rigs. One is permanently stationed at Kelite's southern region headquarters in Beaumont, Tex., and will service the gulf area. The other permanently stationed at Kelite's facility in Los Angeles, will service California. Future plans call for the development of additional rigs, to be stationed at Kelite's facilities in Chicago and Berkeley Heights, N. J.

One of Kelite's new plant-cleaning trailer-mounted rigs.



Humble lubricants

increase operating efficiency — extend engine life

Humble industrial engine lubricants minimize engine deposits and reduce friction wear, allowing your engines to maintain peak operating efficiency. Humble provides a lubricant of exceptional quality for the most demanding lubrication requirements of every industrial engine, regardless of engine type or make.*

At your request, one of Humble's trained lubrication engineers will make a study of your lubrication problems and give you specific recommendations for their solution. This service is without cost or obligation.

And for your grease requirements, we recommend Humble's remarkable new NEBULA® EP 1, a multi-purpose, extreme-pressure grease with constant consistency-temperature properties.

• *For complete information on Humble industrial engine lubricants see your Humble salesman, or phone or write:*

Humble Oil & Refining Company
Sales Technical Service
P. O. Box 2180
Houston 1, Texas

HUMBLE OIL & REFINING COMPANY HUMBLE

Hazlett; J. B. O'Connor, Dallas, president, Dresser Industries; R. E. Reimer, Dallas, executive vice president, Dresser Industries; and Tom Slick, San Antonio, Tex., chairman, Slick-Moorman Oil Corp.

Lawrence was elected to the board for the first time. He moved to a Dresser vice presidency in 1957 from his former position as president of Joy Manufacturing Co. He was appointed executive vice president last December.

Oil Well Supply Division Names Treit, Ozey, Rice . .

as district representative at Edmonton, Alta.; as field representative at Dawson Creek, B. C.; and as field representative at Valleyview, Alta., respectively. The announcement came from W. A. Weir, manager of the Canadian area.

Robert Treit joined Oilwell at Edmonton in 1948 and was named field representative at that location in 1950. He held this position until his latest appointment. D. A. Ozey was employed by the company in 1955 at Edmonton. J. T. Rice was employed in 1956 at Valleyview.

Familiarization Course Begun By Brown Oil . .

wherein participants serve as both students and teachers. The purpose of the course is to train salesmen, operators, supervisors, and distributors in the operation of new tools and equipment.

Participants in Brown Oil Tool Co. course, kneeling are: R. C. Buchanan, Houston, city salesman; Dick Mott, Houston, school supervisor; E. C. Chamblee, Houma, La., division manager. Standing are: Claude Long, Lake Charles, La., district manager; Bill Covington, Houston, operator; John R. Feeser, Houston, sales manager; Frank Meyers, Odessa, Tex., associated with MWL Tool & Supply Co.; and H. E. Clements, Hobbs, N. M., MWL. The latter company is Brown's representative in West Texas and New Mexico.

Five Promotions Announced By Dick Evans, Inc. . .

according to Dick Evans, president of the chemical weed control contracting firm.

Ray Bieri has been moved up to vice president in charge of all operations for both sales and field; Henry Koenig to district manager of Tulsa district; Don Nix to district superintendent at Pampa, Tex.; and Bill Klinck, who has been engaged in oil-field service supply work for 20 years in Oklahoma, Texas, and Arkansas, to district manager of Oklahoma City territory. O. B. McAnally has been promoted to division manager for West Texas and New Mexico, headquartered in Amarillo, Tex.

Dick Evans expects to expand services into the Illinois-Indiana-Kentucky areas next.

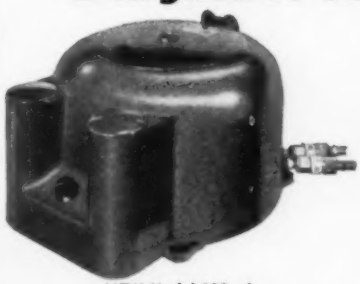
Communications Engineering Co. Hires K. M. Parsons . .

as sales engineer on General Electric 2-way radio equipment for the West Texas-New Mexico area, with headquarters in Midland, Tex.

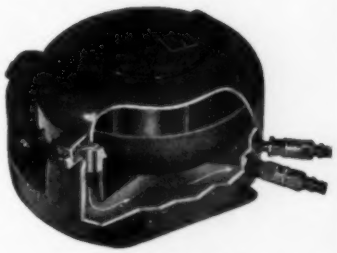
Prior to his employment with CECO, Parsons was employed as com-

WALKER GAUGING EQUIPMENT

Designed to Serve You Better!



NEW Model 100 ml



Model 12.5 Mark 1

WALKER CENTRIFUGES

Model 100 ml for two-100 ml ASTM Pear shaped test tubes, and Model 12.5 Mark 1 for four 12.5 ml API test tubes, are Combination Preheater and Heated Centrifuge. Accurate, Economical, Efficient, Convenient. 6 or 12 Volt Model. Preheats samples; keeps samples hot during the spinning period regardless of weather.

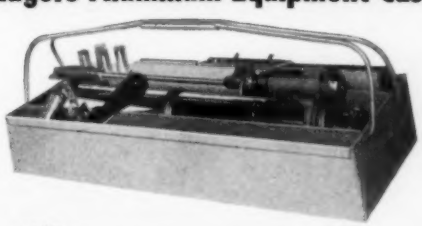
New Model CB Clear Barrel

WALKER-TULSA OIL THIEFS

Metal and Clear Barrel (Model CB)

Both Models Contain all operating features of Walker Oil Thiefs. Simple Operation. Single Trippage, Extension Trip Rod. Rugged Construction. Positive Valve Closure.

Gaugers Aluminum Equipment Case



SERVICE M|M QUALITY

W. L. Walker Co.

Phone Diamond 3-8241

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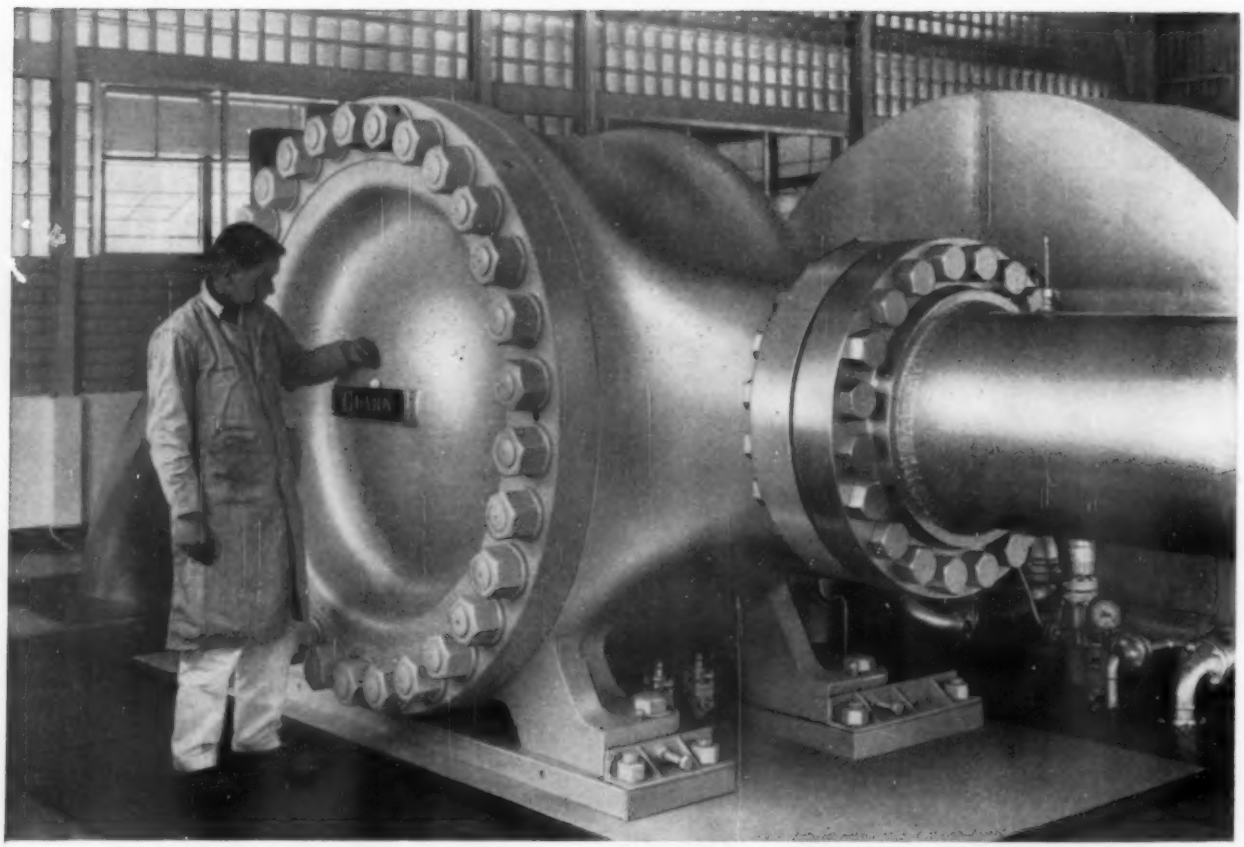
Everything The Gauger Needs From One Dependable Source

Only **CLARK** pipeline compressors
give you

EXPAND



Clark Pipeline Compressors are available in five flange sizes: 12x12, 16x16, 20x20, 24x24, 30x30

Here's What Clark Design Gives You

OVER-HUNG CANTILEVER IMPELLER—Only one shaft seal required.

OIL FILM TYPE SEAL—Completely dependable; field-proved; no moving parts.

INLINE SUCTION & DISCHARGE FLANGES—Simple to install; no additional piping; minimum floor space.

EASILY MODIFIED—Extensive changes in pressure-volume characteristics quickly handled by simple internal modification.

RUGGED CASES—Resist stress from pipe expansion. Extra heavy, fully machined studs on bolt circle.

QUIET—Minimum operating noise; easy on operators.

HIGH OR LOW RATIOS—To match pipeline requirements.

ABILITY

They're the boosters with a built-in future

Clark centrifugal pipeline compressors, designed specifically to meet gas transmission requirements, are built to meet the future.

Now extensive changes in operating conditions can be handled within the same case at minimum cost and without sacrificing efficiency. Clark design permits replacement of the volute, as well as guide vanes and impeller, with components having completely different characteristics.

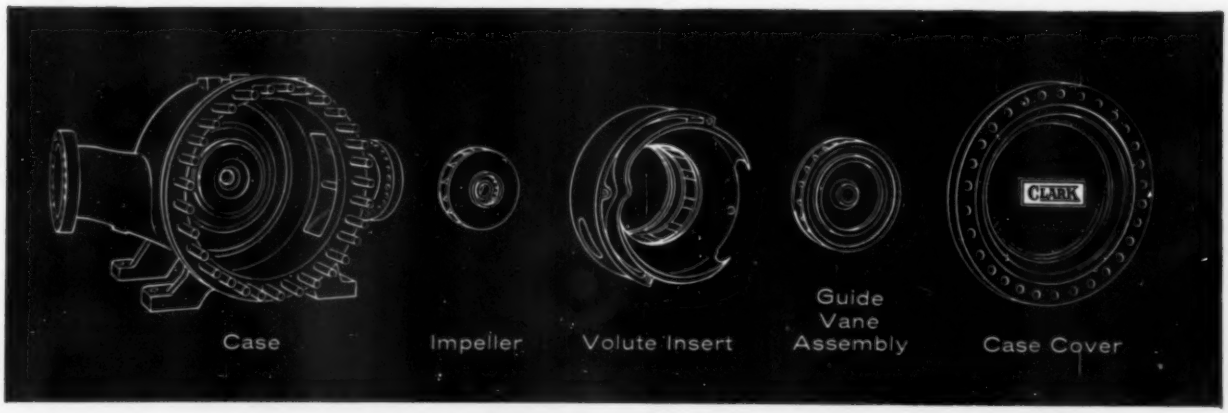
Key to this versatility is the design of the volute as an insert, not as an integral part of the case. Changes are made quickly—just remove the case cover, pull the insert, install a new one. The unit remains perfectly matched, and no piping modification is required.

This versatility is supported by other special Clark features. Extra heavy and rugged cases withstand stress from pipe expansion without distortion. A single oil film type seal provides positive, gas-tight sealing during operation and at shutdown.

Many of these units are operating on the nation's gas transmission pipelines, driven by gas turbines, steam turbines or electric motors. They are supported by Clark's encyclopedia of experience. Your nearest Clark office will gladly give you all the facts and figures.

CLARK BROS. CO. • OLEAN, N. Y. *One of the Dresser Industries*
Sales and Service Outlets in Principal Cities Throughout the World

CLARK **Centrifugal Pipeline Compressors**



Complete internal assembly is easily interchanged to meet future conditions.

PHOTOGRAPHED UNDERWATER AT FLORIDA'S SILVER SPRINGS

Underwater is home for this motor!

New Louis Allis Immersible motor is built to operate in water, sewage, or liquid chemicals

The Immersible motor can be adapted to operate in any kind of liquid — fresh or salt water, sewage, chemicals, or abrasive industrial cutting oils. It's the ideal means to provide power in a vat or sump — at the bottom of a pool, lake, or ocean!

No matter how deep your setting, the Immersible motor provides close-coupled power — saves you the need for expensive jack-shafting, intermediate bearing supports between pump and a surface-mounted motor, and mounting structures.

The motor is oil-filled and sealed at the factory. Diaphragm breathers equalize internal and external pressure — eliminate pressure at the shaft seal and prevent leakage. All joints are sealed to keep water and dirt out. Vinyl-coated housing and stainless or suitably plated exposed parts resist corrosion. Mating surfaces of the housing and flange are precisely machined to provide accurate alignment of the pump impeller and casing.

The Immersible, as shipped, is ready for horizontal or vertical mounting on pumps, agitators, mixers, or special equipment. Sizes range from ¾ to 40 hp. For additional information contact your local Louis Allis District Office, or write for Bulletin 2300, The Louis Allis Co., 449 E. Stewart Street, Milwaukee 1, Wisconsin. But do it today!

SM-109

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

munications engineer for Motorola, Inc. He obtained his first class radio-telephone license in 1951 and has had experience in all phases of 2-way communications.

Otis Engineering Corp. Assigns A. N. Thomson . .

as a gas lift representative in its division office at Odessa, Tex.

Thomson was formerly associated with Magnolia Petroleum Co. in Midland, Tex., as area petroleum engineer in the gas-lift division. Otis Engineering operates branches in major producing areas in the Mid-Continent and Gulf Coast regions. It also has subsidiary companies in Canada and South America.

Bronson Heads Research And Development Lab . .

C. L. BRONSON

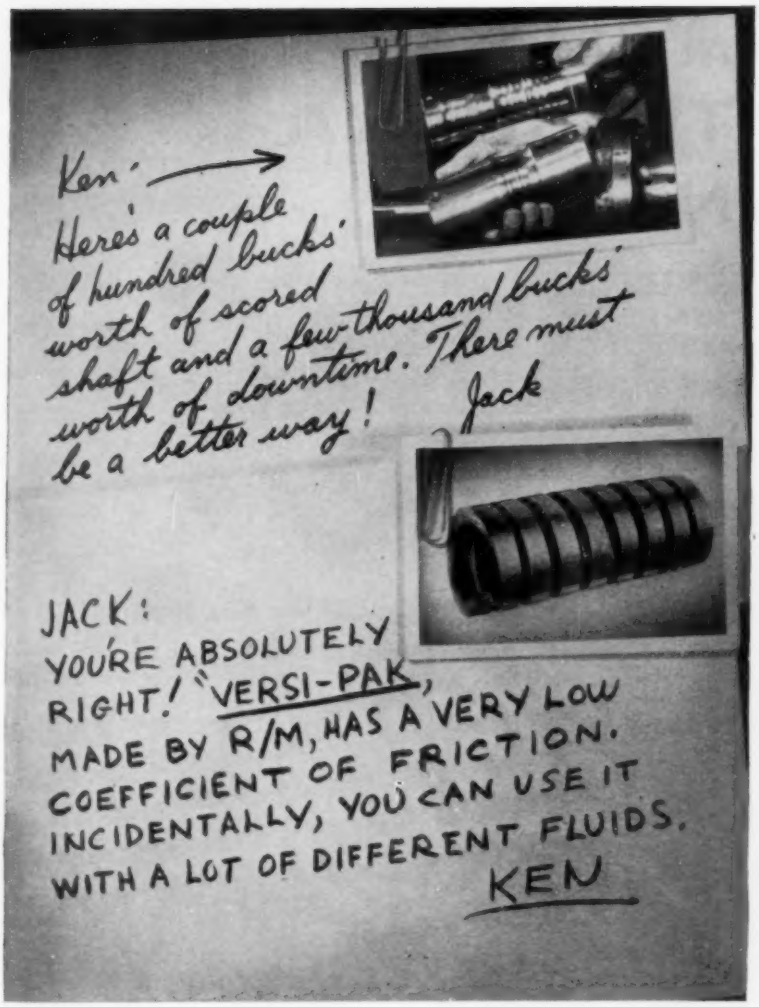
of Varel Manufacturing Co., Dallas, Tex., a manufacturer of rotary rock bits.

For the past 2 years, C. L. Bronson has supervised installation of a new Varel heat treat plant. Previously, he was chief metallurgist in the lab and heat treat department of R. G. LeTourneau Corp. in Longview, Tex., and Peoria, Ill.

Happy Co. Announces Sales Organization Transfers

R. F. Snowden has been transferred to Wichita and will cover the State of Kansas, formerly worked by E. L. Williams, who has been transferred to Midland, Tex. Roy Rowe has taken over North Oklahoma with headquarters at Tulsa, formerly headed by Snowden. Bill Holbert has assumed duties at Durango, Colo., to cover the Four Corners area recently added to Happy's districts and Rocky Mountain region. Holbert was formerly at Midland. Harold Ashworth has been transferred to Oklahoma City from Seminole, Okla.,

Happy manufactures and sells Flexdrive pumping units, Beam safety switches, fin-type air cooling equipment, friction-type engine starters, gas volume tanks, Floco oil level controls, Vortox air cleaners, Dacron V-velts


Ken. →
Here's a couple of hundred bucks' worth of scored shaft and a few-thousand bucks' worth of downtime. There must be a better way!
Jack
JACK:
YOU'RE ABSOLUTELY RIGHT! "VERSI-PAK", MADE BY R/M, HAS A VERY LOW COEFFICIENT OF FRICTION. INCIDENTALLY, YOU CAN USE IT WITH A LOT OF DIFFERENT FLUIDS.
KEN

If the combination of high pressure, high shaft speed, and lubricant loss is making big headaches for you, get the details on "versi-pak"® from R/M's experienced packing engineers. This non-jacketed plastic packing gives you outstanding service in a great variety of applications with solvents, caustics and weak acids. It provides excellent retention of its original lubricant, reduces heat build-up.

R/M "Universal" Plastic Packings, available in five different types, are recommended for those applications in which jacketed plastic packings containing flake graphite or mica are indicated. Their service range is so varied that you are urged to call on R/M for further details and specifications. R/M engineers have amassed a wealth of experience in the oil and gas field, and this experience is at your disposal. Call on R/M!

R/M MAKES A COMPLETE LINE OF MECHANICAL PACKINGS — including Vee-Flex,® Vee-Square,® Universal Plastic, and "versi-pak"®; GASKET MATERIALS; and "TEFLON"® PRODUCTS. SEE YOUR R/M DISTRIBUTOR.
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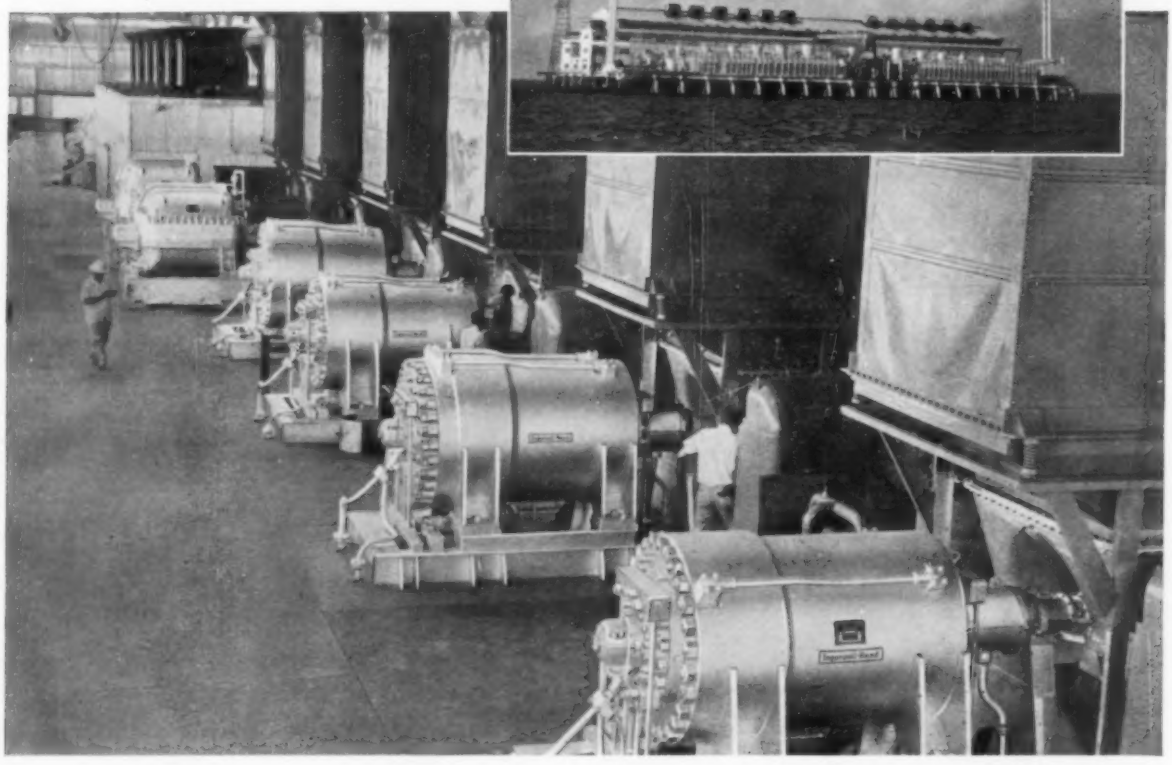
Brake Blocks • Clutch Facings • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

At Creole's
TIA JUANA No. 2...



Twelve I-R Centrifugal Compressors are injecting a maximum of 300,000,000 cu. ft. of gas per day

Located 7 miles offshore on Lake Maracaibo, Creole Petroleum Corporation's second giant gas injection plant—Tia Juana No. 2 is the largest of its type in the world.

Here, twelve Ingersoll-Rand centrifugal compressors, each driven by an 8,000-hp gas turbine, inject a maximum of 300 million cubic feet of gas per day into huge underground oil reservoirs, increasing oil recovery, conserving natural gas and permitting lower production costs by sustaining natural flow. The 12 compressor units are arranged in two six-stage systems operating in parallel, with a final discharge pressure of 1800 psig.

At Creole, the performance of Ingersoll-Rand centrifugals is a matter of record. Ten units, with a capacity of 137 million cubic feet per day and discharge pressure of 2,000 psig, have been in virtually continuous operation on Tia Juana No. 1 since its completion in 1954. *And 14 additional Ingersoll-Rand units are now on order for Platform No. 3.*

Whatever your compressor problem, Ingersoll-Rand can supply the unit best suited to the job—centrifugal, reciprocrating or axial-flow rotary.

Ingersoll-Rand

12-765

11 Broadway, New York 4, N.Y.

COMPRESSORS • TURBO BLOWERS • ROCK DRILLS • AIR TOOLS • CENTRIFUGAL PUMPS • CONDENSERS • GAS AND DIESEL ENGINES

and Sure Grip sheaves, flat belting, industrial hose, floor matting, well and equipment guards, transmission equipment, and other oil industry items.

Standard Magnesium Corp. Appoints Frank Bright . .

FRANK BRIGHT

as sales manager, R. M. Wheeler, president, has announced.

Bright joined Standard Magnesium after spending 9 years with Manning, Maxwell, & Moore as district sales manager in Tulsa. Prior to that he served on the faculty of the University of Tennessee.

Standard Magnesium supplies magnesium ingot to equipment manufacturers and magnesium flux to foundries.

Byron Jackson Tools, Inc. Names H. C. Starr . .

H. C. STARR

southern Louisiana district manager, according to Garth Nicolson, vice president and general manager.

Prior to joining BJ in June 1956, Starr was associated for 8 years with Phillips Petroueum Co. in Venezuela, during which time he was district superintendent in South and Central America and most of the Caribbean Islands.

In his new capacity, he will manage the sales of oil tools and equipment in the Louisiana Gulf Coast.

M. T. Mallard Is Marketing Specialist for Ansonia . .

specializing in the petrochemical field. A. J. W. Novak, general sales manager of Ansonia Wire & Cable Co., said that Mallard joined the company in 1956 as assistant plant superintendent and that he had recently served as sales engineer.

Mallard was originally employed as a chemist on rubberized fabrics, heavy chemicals, and explosives for the Du Pont Co. From 1930 to 1943, he was a research and development chemist on rubber and plastic insulations for wire and cable at General Electric Co., and subsequently was employed as a technical service representative on synthetic rubbers for

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PULSE
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FOR REMOTELY INDICATING:

Liquid Level to 1/8" increments
Temperature from spot or averaging temperature bulbs.
Positive Displacement meters
Alarm—visual and audible signals—for Hi-Low Liquid level and malfunction of valves, motors,etc.
***Specific Gravity**
***Pressure**

ADDITIONAL FEATURES INCLUDE:

Fingertip **Control** of electric motor or solenoid operated valves, etc.
Automatic **Tank Scanning** at predetermined intervals for liquid level and temperature.
Receiver Output suitable for automatic data logging equipment.

**These two items are available on special order only and indicate the versatility of the Pulse Code Telemetering Systems.*
Write for Bulletin CP-3012 on "Varec" PULSE CODE Telemetering.

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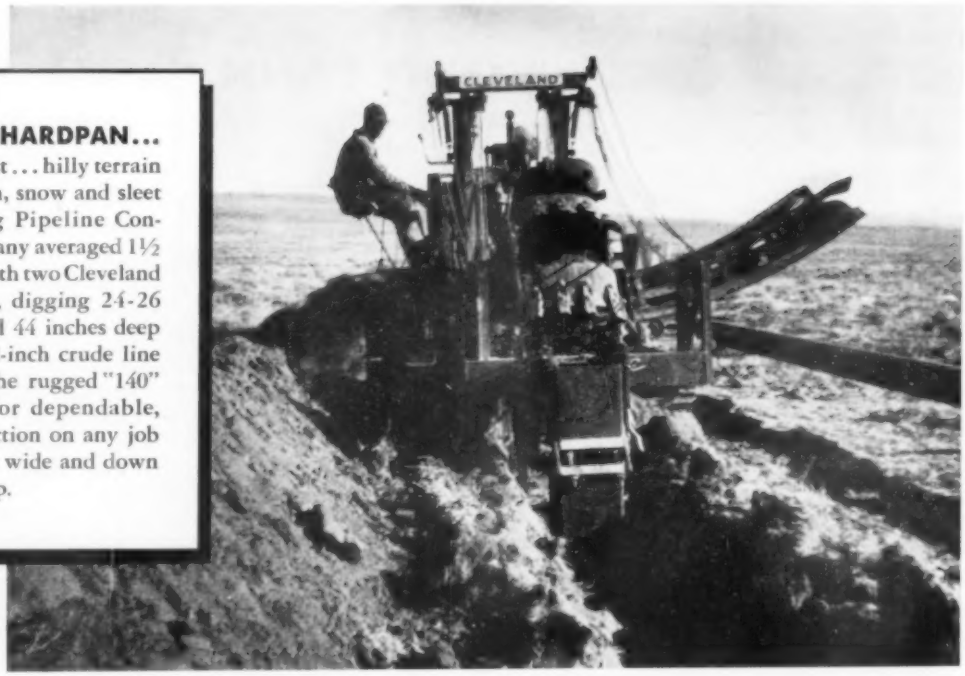
WYOMING HARDPAN...

18 inches of frost... hilly terrain ... frequent rain, snow and sleet ... yet Sterling Pipeline Construction Company averaged 1½ miles per day with two Cleveland 140 Trenchers, digging 24-26 inches wide and 44 inches deep for a 34-mile, 8-inch crude line near Casper. The rugged "140" has no equal for dependable, low-cost production on any job up to 30 inches wide and down to 5½ feet deep.



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The CLEVELAND TRENCHER Co.

20100 St. Clair Avenue • Cleveland 17, Ohio

Integrity

HAS BUILT OUR REPUTATION

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BETTER

PIPE LINES

Houston
CONTRACTING COMPANY
GENERAL CONTRACTORS
Laurence H. Favrot • R. P. Gregory • Geo. A. Peterkin

OIL • GAS
GASOLINE
WATER PIPE LINES

2807 Buffalo Speedway
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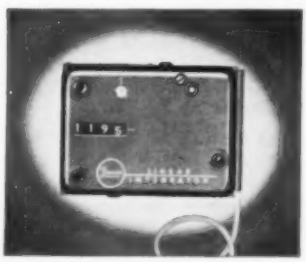
New Series of INTEGRATORS

Strip Chart Recorders—for Flow Totalization, Temperature Recording, Averaging.

Type: **LIBRASCOPE Model 25 Computing Linear Integrator.**

Applications: **Fits most standard strip chart recorders for area computations in gas analysis procedures, temperature recording averaging and flow totalization where a direct or remote reading is required. The Integrator is normally mounted in a position to accept the output of the transducer or recorder pen motion as an input.**



Features: **Model 25 is designed to provide a fast, accurate, reliable and continuously integrated total of data as it is being recorded or presented. Ends inaccuracies of totalizing by eliminating manual integration. It is compact and easy to install. With recommended lubrication, a trouble-free, long life is assured.**

Construction and Operation: **Model 25 Integrator can be installed on any device having a shaft rotation or displacement as an output. It is a ball disc integrating mechanism having a counter and an electrical pulse switch for remote reading. Dimensions: 3 in. x 4.38 in.; weight: 1.5 lbs.**

Other Librascope Integrating Mechanisms: **Ball/Disc Integrator, Flow Computer. For descriptive catalogs, write Librascope, Inc., subsidiary General Precision Equipment Corporation, 810 Western Avenue, Glendale, California.**

(Advertisement)

Hycar Chemical Co. of Akron, Ohio. Prior to joining Ansonia, he was assistant plant manager and director of research for Cornish-Rutland Co., Williamstown, Mass.

Richard Mill Heads New Dallas Branch Office . .

RICHARD MILL

of H. O. Trerice Co., according to J. L. Brackett, sales manager. Mill served in Trerice Detroit home office prior to his transfer to Dallas.

He will cover Texas, Oklahoma, and New Mexico to better serve customers in those states.

St. George and Keller Assigned to Key Posts . .

of the Ensign Carburetor Co., Paul W. Ensign, president, has announced.

A. J. St. George, formerly manager of the Chicago branch, is now sales manager. He succeeds R. R. Wyker who has retired. Succeeding St.

A. J. ST. GEORGE

G. W. KELLER

George is Grant W. Keller. He has served Ensign's eastern clientele out of Chicago for 10 years as engineer.

St. George joined the company in 1937 and will make his headquarters at the principal office in Fullerton, Calif.

L. O. Ward, Jr., Named Advertising Manager . .

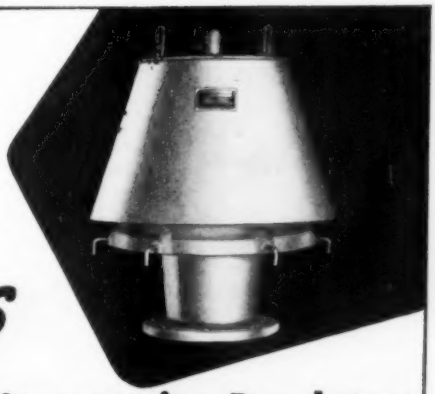
of the Thompson-Ramo-Wooldridge Products Co., according to Dr. Joseph F. Manildi, general manager.

Thompson - Ramo - Wooldridge is a subsidiary of The Ramo-Wooldridge Corp. and Thompson Products, Inc. It was established to market the RW-300 digital computer, and other products in the field of industrial process control.

Ward was formerly head of the staff technical information department for Ramo - Wooldridge, and prior to joining R-W, was associated with General Dynamics Corp.'s electric

customer reports prove

Big Savings



with OCECO V-130 Conservation Regulators

Exclusive construction assures tight leak-proof closure fully up to operating setting—quick opening—and extremely high flows even at low pressures.

Oceco V-130 Conservation Regulators provide **greater flow capacity,** size for size, and pressure for pressure, **specially at low pressures than ever available before.** Our exclusive construction prevents vapors from escaping at less than set operating pressures. Flexing of the membrane peels off any icy formations, preventing freeze-ups. **These valves bring never before secured all weather** economy and dependability to the conservation of volatile products stored in cone, round, flat, lifter or expansion roof tanks. **Write for Bulletin No. 552. It gives full details!**

Patent Applied For.

PRESSURE BALANCED CONSTRUCTION

Tank pressures exerted on both sides of the membrane keep membrane under tension —assures tight seating fully up to operating setting—and positive flexing that peels away icy formations preventing freeze-ups.

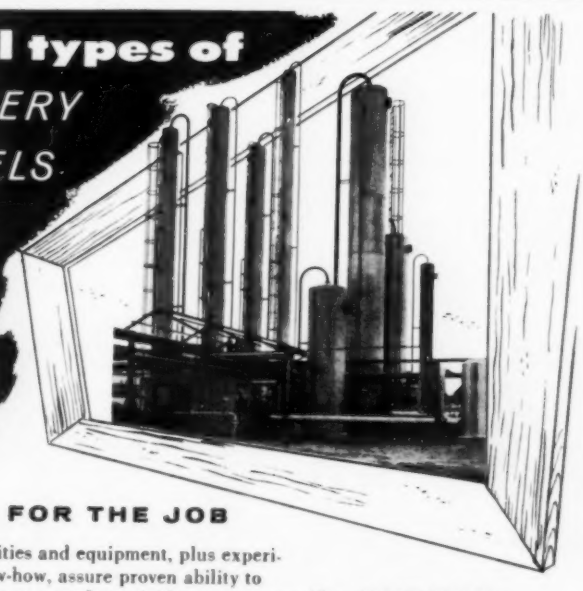
EXCLUSIVE OCECO FEATURE SAVES YOUR VAPOR DOLLARS!

THE JOHNSTON & JENNINGS CO.

4700 West Division Street • Chicago 51, Illinois

Division of PETTIBONE MULLIKEN CORPORATION

all types of REFINERY VESSELS by MASTER TANK & WELDING



FITTED FOR THE JOB

Master's facilities and equipment, plus experience and know-how, assure proven ability to fabricate pressure vessels to rigid engineering specifications. Write — wire — phone MASTER *FIRST* for the finest in steel fabrication.

another MASTERPIECE *fitted for the* JOB

Master also produces API 5LX HI-TEST Expanded Line Pipe

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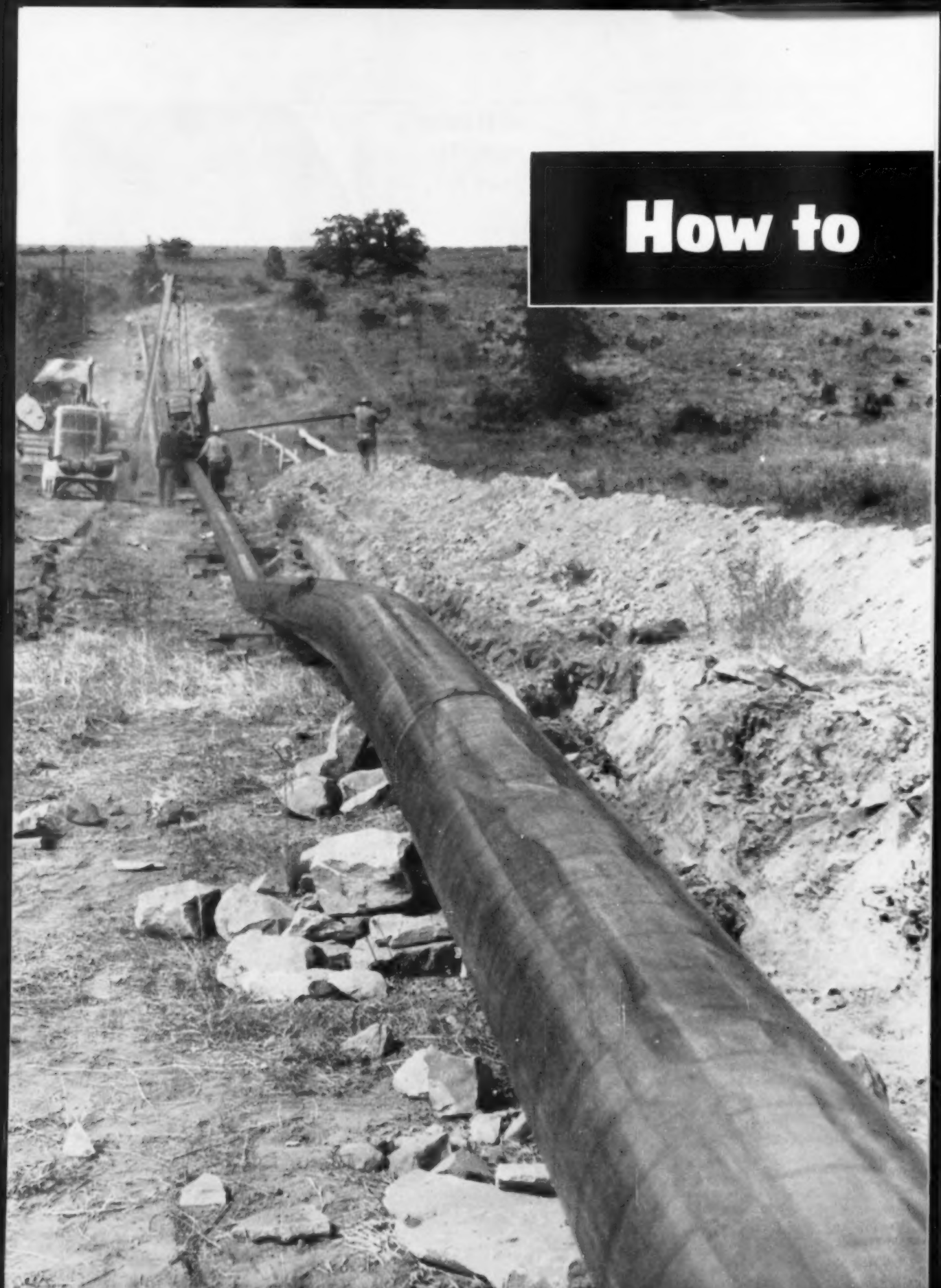

How to

Expedite a Pipe Line

J&L Electricweld line pipe is uniformly round. Wall thickness is constant. It lines up quickly, welds readily, and bends safely to any reasonable course. Lengths to 60 feet minimize field welds.

All J&L line pipe is finished and tested to meet ASTM and API specifications. **Electricweld** is furnished in sizes from 6⅝" through 12¾" O.D. Seamless line pipe in sizes 2⅜" O.D. through 14" O.D. is also available.

You'll want to know more about **J&L's new Electricweld line pipe.** Get the details from any J&L Supply man or write us at Tulsa — P. O. Drawer 2481.

Photo shows a line of coated and wrapped J&L 12¾" O.D. Electricweld being laid in Oklahoma.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

If it's sold by J&L . . . .
It's the best available

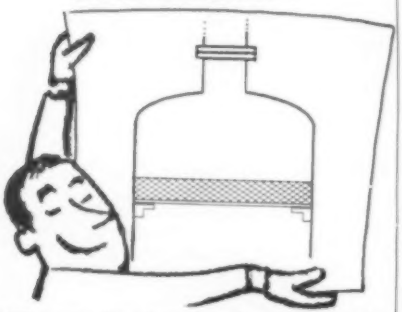
60

CLEAN *
SEPARATION

*99.9% plus
with
YORKMESH DEMISTERS
(MIST ELIMINATORS, ENTRAINMENT SEPARATORS)

Are your "Old Fashioned" entrainment separators doing an inadequate job?

YORKMESH DEMISTERS are the Modern Way to do the Complete job of Mist Removal!



Why not take advantage of our vast experience in improving the performance of process equipment. In the past ten years the outstanding success of thousands of installations is proof of the superiority of Yorkmesh Demisters for entrainment control.

Yorkmesh Demisters are used to improve product quality, to avoid losses, and to increase thruput capacity. Our engineers will give careful consideration to the information you submit and will recommend the best answer to your problem. Write for our new bulletin #21.

YORKMESH DEMISTERS
improve the performance of:
Vacuum Towers • Distillation Equipment • Gas Absorbers • Scrubbers • Evaporators • Knock-out Drums • Steam Drums

YORK

OTTO H. YORK CO., INC.
6 CENTRAL AVE. • WEST ORANGE, N. J.

boat division and the Navy Underwater Sound Laboratory, New London, Conn.

De-Sol-Vall Distributors, Inc., to Sell Solvents . .

GEORGE DeSMET

manufactured by W. & W. Chemical Co., Inc., Levelland, Tex. The newly formed distributor will bring De-Sol-Vall paraffin solvents to new areas and will provide warehousing and distributing points. Heading the new company is George DeSmet, president. Other officers are Harold E. Schoeny, vice president; Byron R. Klein, secretary-treasurer; Chester L. Garner, sales manager; Chuck Aston, petroleum geologist, acting as field consultant.

The first regional field office is in Lubbock, Tex. The manufacturing plant remains at Levelland, Tex.

J&L Supply Division Names L. B. Rainey, Jr. . .

L. B. RAINEY, JR.

assistant manager, project sales department, according to an announcement by Rainey Elliott, president.

Rainey joined J&L in 1936. He has been with the company in various sales capacities at Pittsburgh for the past 22 years.

R. A. Olen, M. E. Ash Elected By FWD . .

as vice chairman of the board of directors and president, respectively, according to George E. Mallinckrodt, chairman of Four Wheel Drive Auto Co. board.

James A. Driessen, who has been with FWD since 1930, will continue in charge of company operations as executive vice president, a position he has held since 1954. Also continuing as part of its top management group are: G. F. DeCoursin, vice president, sales; Philip A. Larnino, vice president, manufacturing; and G. D. Simonds, vice president, engineering. DeCoursin is responsible for all sales and promotion, Larnino for all production, and Simonds for all engineering functions.

Olen has been with FDW since

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with
JZ
QUIET
BURNERS

Any acceptable db level can be reached with John Zink Burner Mutes. The John Zink line includes over 50 gas, oil and combination gas and oil burners for process application. Where noise is a problem, these burners are equipped with John Zink Burner Mutes, the most efficient means of lessening primary and secondary air noise.

The John Zink Company is famous for *workable* solutions to special burner problems. Outstanding research and testing facilities assure perfect on-the-job performance for all new designs.

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INDUSTRIAL BURNERS / AIR HEATERS / DISPOSAL UNITS
INERT GAS GENERATORS

4401 S. PEORIA
TULSA, OKLAHOMA

to all NATURAL GASOLINE MEN

GREETINGS

from the

NATURAL GASOLINE SUPPLY MEN'S ASSOCIATION

We are looking forward to seeing you at the

THIRTY-SEVENTH ANNUAL CONVENTION

of the NATURAL GASOLINE ASSOCIATION OF AMERICA

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Arrow Industrial Mfg. Co.

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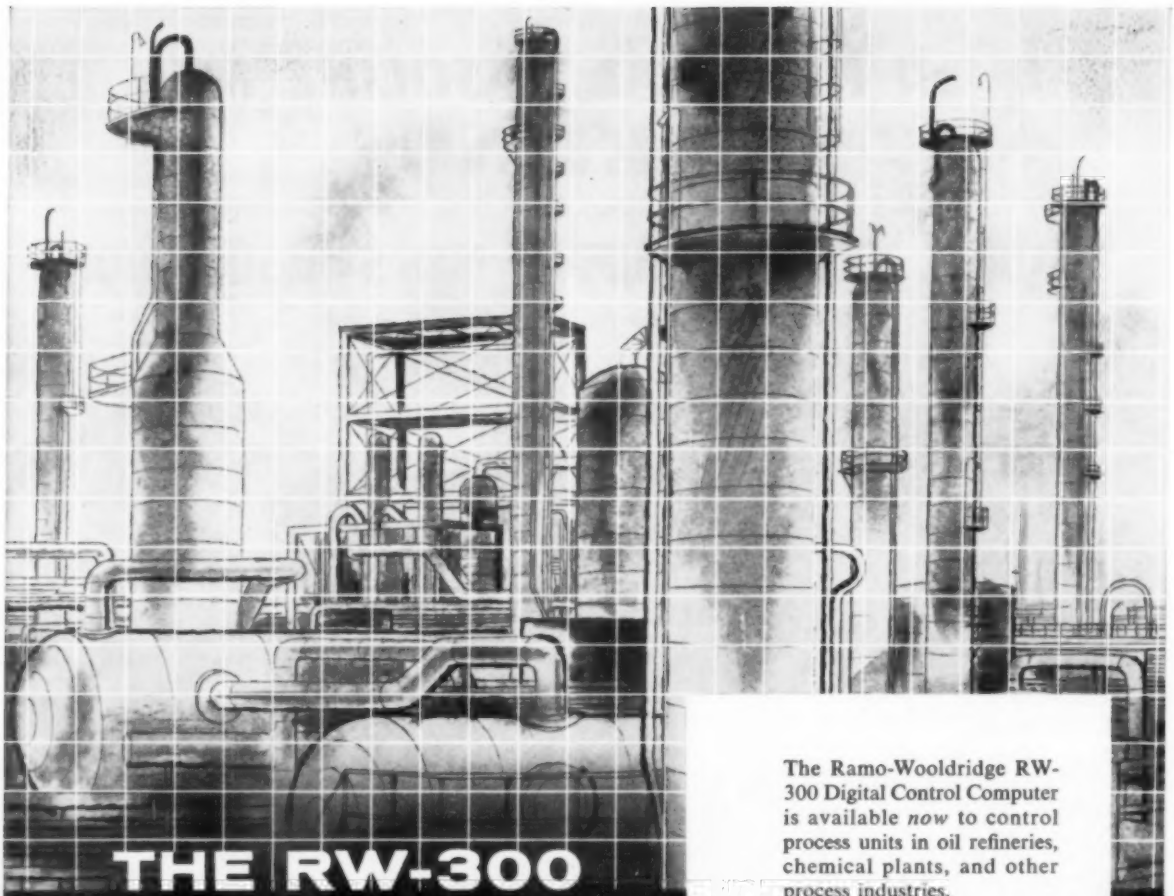
World Petroleum
Worthington Corporation
Wright Chemical Corporation
Wyatt Metal and Boiler Works

John Zink Burner Company



THE RW-300

is the first digital computer for automatic process control and data logging

The Ramo-Wooldridge RW-300 Digital Control Computer is available *now* to control process units in oil refineries, chemical plants, and other process industries.

The new RW-300 offers outstanding opportunities for higher profits from existing and future plants—through reduced operating costs, increased throughput and yields, and improved product quality. These benefits will pay back an investment in an RW-300 digital control system within six months to two years.

For technical information on automatic process control and advanced data logging with the RW-300, write: Director of Marketing, The Thompson-Ramo-Wooldridge Products Company, P.O. Box 45067, Airport Station, Los Angeles 45, California, or call OSborne 5-4601.

See the RW-300 in operation at the ACS exhibition, April 13-17, San Francisco.

THE THOMPSON-RAMO-WOOLDRIDGE PRODUCTS COMPANY

1934. He has served as assistant general manager, general manager, vice president, and president before being elected vice chairman. Ash has been serving as vice president of Paradynamics Inc., which purchased controlling stock interest in FWD last January. He has experience in general corporate management and engineering capacities.

Olen, Ash, and Driessen are directors of the company.

J. E. Goodell Boosted By Bovaird Supply Co. . .

J. E. GOODELL

to assistant general manager of stores, according to Roscoe G. Ayers, vice president and general manager. Working with Wm. J. Bovaird, general manager of stores, Goodell will work in Tulsa.

Starting in 1938 as an office boy, he did field and store work at Chase, Kan. Later he was made store manager at Great Bend, Kans., and more recently has been assistant district manager in Kansas.

In his new position, he will be in active contact on physical properties, inventory, personnel, and sales effort of Bovaird's offices and stores.

Chemical Construction Corp. Names I. S. Boydstun . .

I. S. BOYDSTUN

as manager of a new Gulf Coast-Southwest area office in Houston. James H. Curtis, new president of the New York-based engineering organization, a wholly owned subsidiary of Electric Bond & Share Co., made the announcement.

This office was established to enable the company to work more closely with the industry.

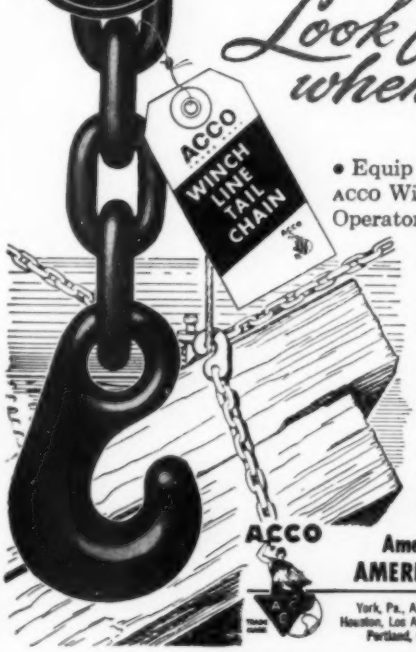
Formerly sales manager for Petreco, Boydstun is known among petroleum and petrochemical groups throughout the Western Hemisphere as well as in Europe.

Chemical Construction will offer the processing industries complete air and water pollution control, incorporating the Pease-Anthony scrubbers and processes for chemical recovery. The facilities of a complete laboratory and plant are available to proc-

an ACCO product

WINCH LINE TAIL CHAIN® is ACCO's Registered Trade Mark

Look for this tag when you buy



• Equip your wire ropes with genuine ACCO Winch Line Tail Chains.* Operators find them unsurpassed for lifting, hauling, loading—in **fact**, for exacting work of all types.

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Write our York, Pa., office for **Bulletin DH-1021.**

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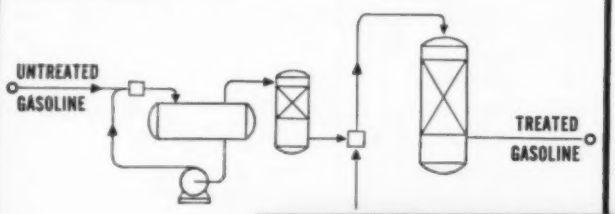

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COPPER CHLORIDE

Tennessee's Copper Chloride was developed to effect efficient Mercaptans removal.

Place your confidence in a basic producer of Copper Chemicals.

CUPRIC CHLORIDE DI-HYDRATE

Other products of interest— Ferric Sulfate—Copper Sulfate, Copper Oxide—Sulfur Dioxide.

For samples make request on your company letterhead.

TENNESSEE TG CORPORATION

617-629 Grant Building, Atlanta, Ga.

cessing groups for preliminary studies and economic justification of new or old processes.

McCullough Tool Co. Opens New Service Branch . .

at Mount Pleasant, Mich., according to O. J. McCullough, vice president.

J. L. Booher, service unit operator, formerly at McCullough's Carmi, Ill., branch, is in charge of operations. The branch is equipped to serve the oil industry in the area on a 24-hour basis with all wire line service offered by McCullough.

Webster Engineering Co. Elects New Officers

Frank H. Adams, Toledo, Ohio, formerly president, is now chairman of the board; Leon S. Regan, Tulsa, advanced from vice president and general manager to president; George C. Bergtholdt, Tulsa, went from vice president to vice president and general manager.

Other officers of Webster are: Henry M. Heyn, Toledo, vice president; Hugh A. Macfarline, Tulsa, secretary and treasurer; William D. Charles, Tulsa; Eugene P. Heiles, Toledo; and Albert J. Buckenmeyer, Toledo, assistant secretary and assistant treasurer.

Webster Engineering, Tulsa, a subsidiary of Surface Combustion Corp., is devoted to the development, design, and manufacture of burners for firing all types of boilers and oil refinery equipment.

for peak heat exchanger efficiency . . .

HARTZELL'S NEW CONTROLLABLE PITCH FAN

The Hartzell Controllable Pitch Fan meets a long-standing need in the petroleum industry for a precise method of controlling a variable flow of air to maintain predetermined temperatures. On test installations, these new fans have proved their ability to hold outlet temperature fluctuation to plus or minus 1½° F. And, while achieving this highly accurate level of control, they consume up to 50% less power than required by conventional fixed-pitch fans.

In a temperature sensitive control system depending on air flow, the amount of air required to achieve the necessary cooling depends on the temperature of the air. High air temperatures require high air deliveries, low air temperatures require minimum air deliveries. With a Hartzell Controllable Pitch Fan, variable air delivery is accomplished by variation in blade pitch setting. The fan assembly responds instantly and automatically to conventional temperature sensitive control equipment — increasing blade pitch to deliver more air when outlet temperature rises, decreasing blade pitch and delivering less air when outlet temperature falls.

For complete details on Hartzell's controllable pitch heat exchanger fan, write for Bulletin 111-B or call your nearby Hartzell field engineer.

HARTZELL PROPELLER FAN CO.
Division of Castle Hills Corp.
72 Thomas Blvd. Piqua, Ohio

CEC Appoints C. W. Bishop And R. D. Enochs . .

as sales manager of the analytical and control instrument division and manager of the district sales office in Dallas, Tex., to succeed Bishop. William F. Johnson, director of sales made the announcement.

C. W. BISHOP

R. D. ENOCHS

Bishop had been district manager in Dallas since November 1956. Previously, he was a field engineer in the southwestern regional office. Prior to joining Consolidated Electrodynamics Corp., he was a research physicist with Continental Oil Co., and a junior physicist with Phillips Petroleum Co.

Enochs joined CEC in 1951 as an installation engineer. He became a training engineer in 1952, a supervisor in instrument order service in 1953, and assistant to the director of sales in 1956.

Nordberg Manufacturing Co. Boosts Philip Wallach . .

to district manager of the Great Lakes territory of the engine division, R. W. Bayerlein, division vice president, has announced. Wallach will make his headquarters at the district office in Cleveland, Ohio.

Wallach joined Nordberg 2 years ago as sales engineer and since that time has concentrated his work in the marine, utility, and pipeline markets.

The Great Lakes territory now includes Michigan, Indiana, Ohio, West Virginia, western Pennsylvania, western New York, and greater Toronto, Ontario area. He will follow marine engine application for the Great Lakes and inland waterways as well as utility, pipeline, and industrial

New Reliance 10 hp. Pumping Motor at work in the Batson Field in Texas.

New Reliance Oil Field Motors Designed for Oil Well Pumping Service

The New Reliance Oil Field Motors are high torque, medium slip motors. This tested and proved design is tailored to load conditions peculiar to oil well pumping service. The special Reliance design provides maximum motor life, and minimum current surge.

Motor Enclosure

The mechanical design of Reliance Oil Field Motors meets all outdoor conditions. Openings are screened and all electrical components are protected from the elements. Metermatic Bearing Lubrication, exclusive with Reliance, keeps bearings greased for extended periods of time without attention.

Deliveries

Reliance Oil Field Motors can be shipped immediately from Cleveland, Tulsa, Dallas and Houston. These are 220/440 volt, 1200 rpm. motors from 5 through 25 hp. Other motors are available from Cleveland. Stocks of Oil Field Motors will soon be available in California and the Rocky Mountain States.

Contact your Reliance Representative for prices and further details.

RELIANCE ELECTRIC AND ENGINEERING CO.

DEPT. 104A, CLEVELAND 17, OHIO
CANADIAN DIVISION: TORONTO, ONTARIO
Sales Offices and Distributors in Principal Cities

Now! The greatest concentration built into a truck engine!

Ford's all-new Super Duty V-8's—with displacements of 401, 477 and 534 cubic inches—are designed to handle GVW's up to 51,000 lb. and GCW's up to 75,000 lb. on America's toughest runs. And their endurance has been proved, not only in dynamometer labs and on the proving grounds, but in commercial fleets from coast to coast.

You get more miles with less downtime! These all-truck engines combine an entirely new concept of engine cooling with the latest developments in mechanical design and materials, setting new Ford standards of performance and dependability in heavy-duty truck service. Here is the "how and why" of Ford's superiority:

Exclusive three-stage cooling provides fast, uniform warm-up. Coolant flow is controlled by a second thermostat that balances the rate of warm-up and expansion of block and heads. Stress concentrations and the possibility of head warpage are virtually eliminated.

High-capacity water pump, the heart of Ford's cooling system, circulates over 200 gallons per minute. High volume coolant flow, with little or no aeration, supplies vital scrubbing action at valve guides and seats. Another advantage of this unique pump—its high capacity (50% more than competitive types) is obtained with no increase in required horsepower.

Water-jacketed fuel-air intake passages, in manifold *and* heads, maintain correct and uniform fuel temperatures from carburetor to combustion chambers. This results in proper vaporization and equal distribution of fuel-air mixture to each cylinder for improved economy and maximum engine smoothness.

New "In Block" combustion chambers transfer heat concentration from heads to block for 360° chamber cooling. This transfer allows better cooling of head and valve areas, greatly increasing the life of these parts. Combustion heat absorbed by the head of the aluminum alloy piston is transferred to the long, solid piston skirt. From there it is readily dissipated through the cylinder wall into the coolant which surrounds cylinder throughout the entire length of piston travel. The result is long life pistons and rings.

Internally mounted oil cooler keeps oil at lower temperatures for better lubrication. Reduced oil temperatures maintain greater oil film strength and reduce oil carbonization. Also, cooler oil means cooler running, longer lasting rod, main and camshaft bearings.

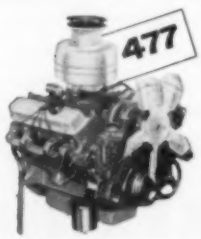
Fully machined combustion chambers mean close tolerances for accurate regulation of compression pressures. In Ford's new Super Duty V-8's, all surfaces of the combustion chamber (cylinder wall, bottom of head and top of piston) are precision-machined. Piston tops have a tapered step to maximize turbulence for improved combustion with regular grade gasoline. The smooth, straight surfaces of this wedge-shaped combustion chamber eliminate deposit-forming pockets to minimize harmful preignition.

Turbulence Top pistons have four rings and three of them, including the oil ring, are chrome-faced for long life. The top ring groove has a bonded cast-iron insert to further reduce wear. Piston tops are extra thick to withstand high compression pressures. Each piston contains thermal struts that control expansion for a precise fit, hot or cold.

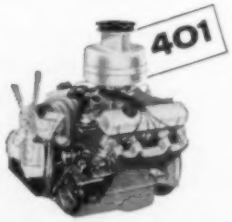
Hard-faced intake *and* exhaust valves with wear-resistant valve seat inserts are a Ford exclusive. Valves are made of heat-resistant materials and heads are dish-shaped to allow them to seat readily. To minimize the possibility of sticking, valve stems are electrolized, a surface treatment previously restricted to aircraft engines. Positive rotators provide a self-cleaning action for

NOW!
Three all-new all-truck V-8's

277-hp Short Stroke V-8 . . .
Torque: 490 lbs-ft @ 1800-2300 rpm



260-hp Short Stroke V-8 . . .
Torque: 430 lbs-ft @ 1800-2300 rpm



226-hp Short Stroke V-8 . . .
Torque: 350 lbs-ft @ 1800-2300 rpm

American Business buys more Ford Trucks than any other make!

# of endurance features ever

They're all standard in Ford's new Super Duty V-8's

more perfect seating and sealing. Any valve material requires good cooling for long life. Ford's new Super Duty engine design makes more coolant available for lower valve temperatures. This coolant flowing past Ford's integral valve guides quickly carries away valve heat. In addition, exhaust valves are sodium-filled for rapid transfer of heat from head to stem. The sodium is added by a unique process that eliminates welding, thereby strengthening the valves.

Hot testing of every Super Duty V-8 is a typical example of Ford's quality control. Each engine is run for 20 minutes to check smoothness, timing, valve lash adjustment, oil pressure, and push rod rotation.

The engine is then partially disassembled. Parts are inspected for condition and alignment. Special attention is given to bearings and other items that might cause premature failure. The engine is then reassembled and run for about 10 minutes to check timing, noise level, acceleration, smoothness and coolant, oil or compression leaks. Only Ford uses such a detailed inspection of every engine. This is done to provide you with a more dependable truck.

New submerged electric fuel pump virtually eliminates vapor lock and maintenance problems. Mounted in the bottom of the tank, it pushes solid fuel under pressure from tank to carburetor. Its electric motor is sealed in a stainless steel capsule, and operates the pump by magnetic drive.

Every engine part is a truck engine part designed and built exclusively for Ford's all-new Extra Heavy Duty trucks. The same attention to detail required for durability in the major components has been carried over to all other parts as well. Listed below are but a few typical examples:

Stainless steel gaskets at heads and exhaust manifolds practically eliminate tie-ups due to blown gaskets.

No external oil lines to break. Oil filter and air compressor are mounted directly to block.

Valve stem seals are of same material developed for use in government missile program.

Rotor-type oil pump maintains high output, virtually unaffected by normal wear from extended operation.

Dual exhaust system provides far easier breathing and higher volumetric efficiency.

Alternator system replaces generator for longer electrical life.

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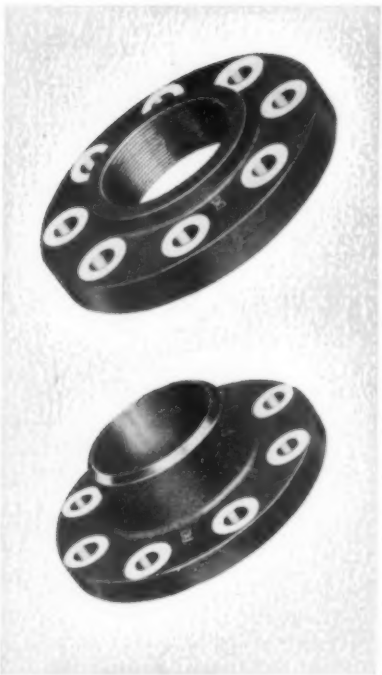

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Harrisburg Drop-Forged Steel Pipe Flanges are made to A.S.A. standards for oil companies, ship builders and pipe fabricators. They come in threaded, butt-welding, slip-on welding, Van Stone and blind types and are shot-blasted and dip-coat finished with a rust preventative black lacquer. Be sure you make it Harrisburg when you want flanges.

More than a Century (H) in Harrisburg 6, Pa.

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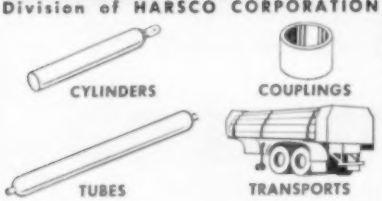

engine sales. He succeeds G. B. Wright, who resigned from the company.

Republic Supply Co. Names J. F. O'Neill, Jr. . .

to direct a newly-established merchandising and materials division. O'Neill was formerly district manager of the Shreveport, La., district before moving to Oklahoma City. He will be responsible for improving merchandising techniques and the installation and administration of advanced methods of warehousing and customer services.

Cook Testing Co. Opens New Branch Office . .

at Snyder, Tex., according to R. M. Cook, president. The branch will provide complete formation testing and nitrogen service in active territory in the Snyder area.

It is the twelfth branch of the company to be opened in the past several months. Cook manufactures nitrogen in Odessa, Tex., and provides nitrogen service for formation testing in any area required.

Bethlehem Supply Co. Delivers Drilling Rig . .

for operation in Venezuela to D & D Drilling & Construction Co., C.A., subsidiary of Falcon Seaboard Drilling Co., Tulsa.

The rig, a trailer-mounted Bethlehem C-50 draw works with sand reel, G-65 16-in. slush pump and complementary equipment, was assembled in D&D's Anaco, Ven., yard prior to moving to its first drilling location for Mene Grande Oil Co. in the greater Santa Barbara area, State of Monagas in eastern Venezuela.

The rig is under the supervision of E. L. Walton, general manager of D&D, and Tom Alexander, drilling superintendent.

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Model 4T Pow-R-Ditcher

Here's a real workhorse that digs for LESS because it costs so much LESS! Ideal for the light construction field in laying gas pipe, water and cable lines and digging home foundation footings. Very maneuverable for those "tight spots", the 4T is only 6' high, 13' long and 48" wide. Digs 6" to 14" wide and up to 17' per minute. Handles most small ditching jobs at a fraction of the cost of more expensive ditching machinery.

"Small W-2 Pow-R-Ditcher is Finest for Small Services"

. . . says Post and Lee Service of Alta, Iowa. "In one month we completed over 100 services (7100 feet). It was rugged work but the W-2 handled it with no breakdowns except a pair of belts. We keep ahead of schedule with the W-2." The W-2 digs 2½" to 4" wide and is ideal for gas service, electrical service and shallow water lines.

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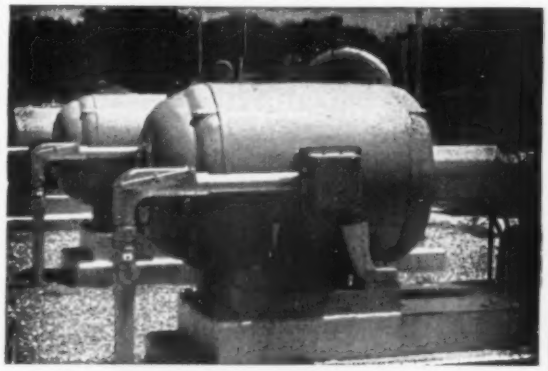

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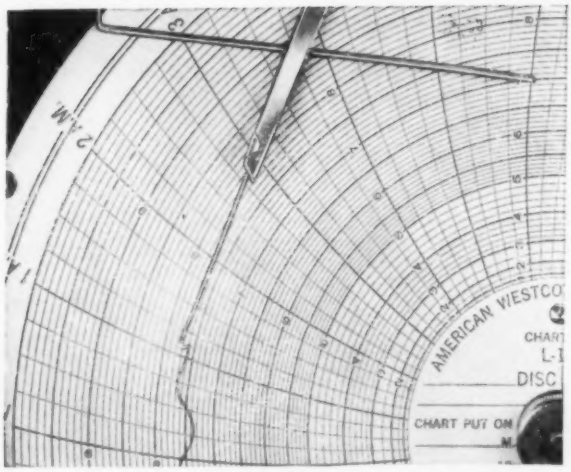
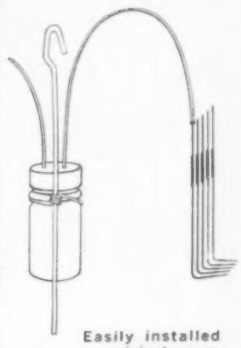


CANNON PENS

assure legible charts ...eliminate inking problems



Easily installed as original or replacement equipment in all standard recording instruments. Available in five sizes and angles—special pens upon request.

Cannon controlled-flow capillary meter pens provide exceptional dependability and long life with minimum maintenance. Easy to install, these precision pens produce accurate chart records of maximum legibility and continuously record up to a full year without refilling reservoir.

- **Ends Unrecorded Intervals.** Unaffected by pulsating flows, chart speeds, rapid pen movement.
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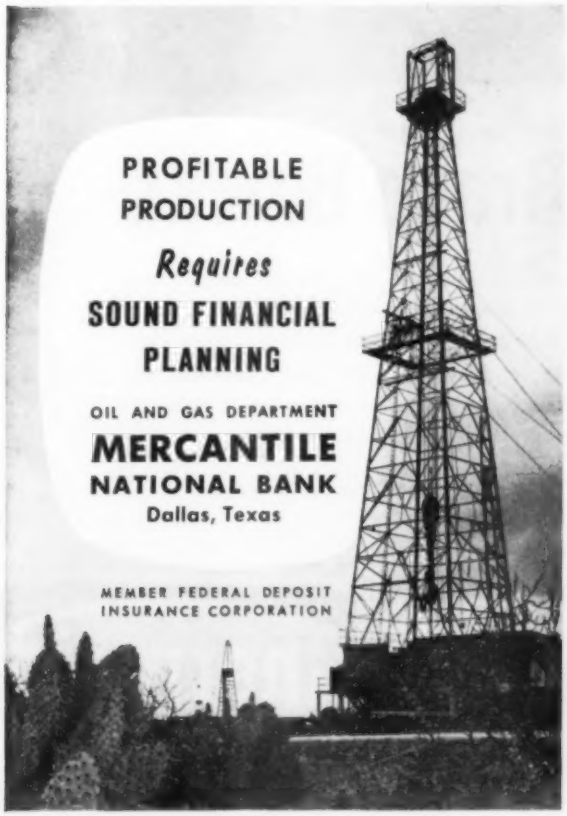

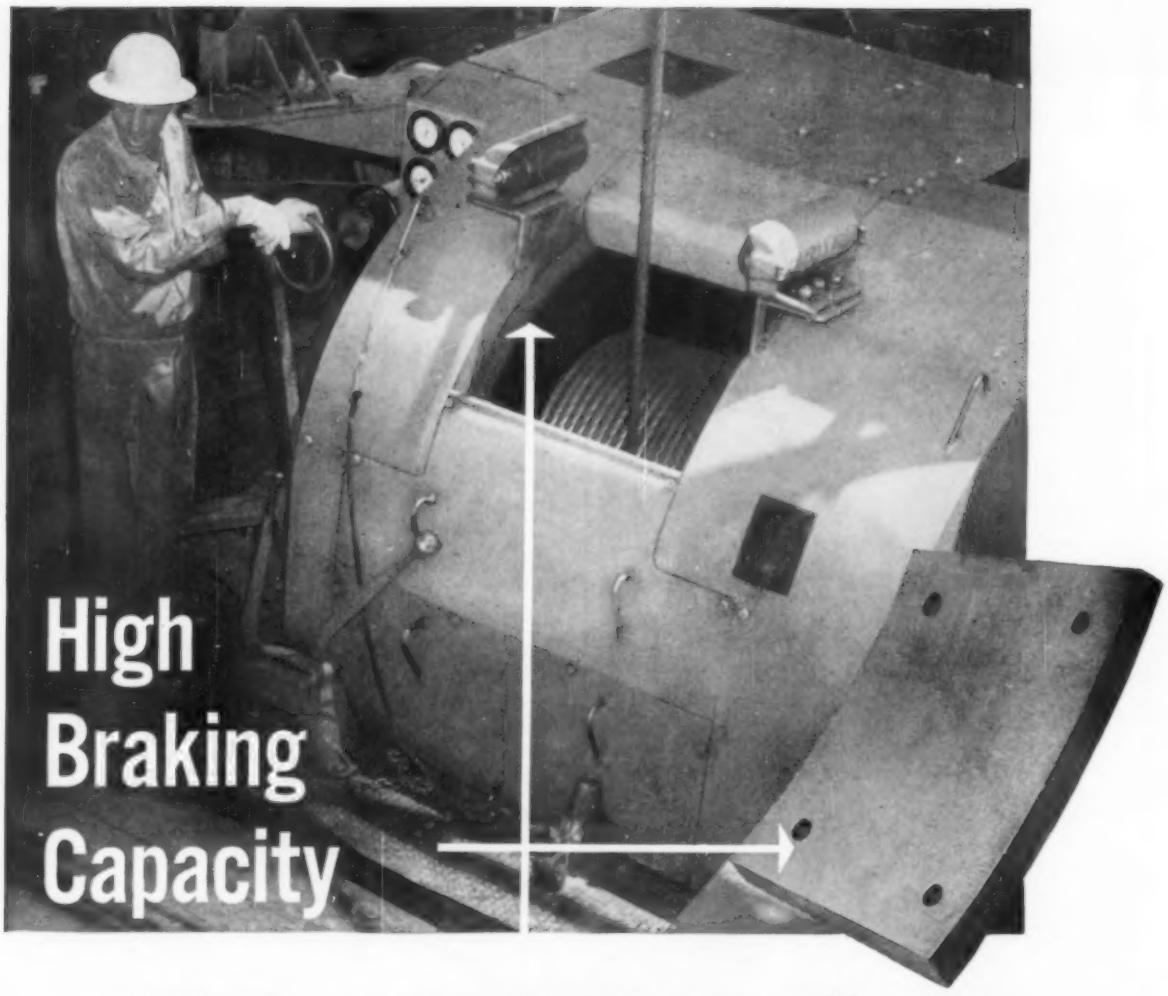

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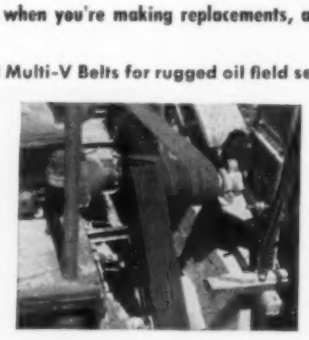
Choice of leading original equipment manufacturers and drilling contractors everywhere, Thermoid Brake Blocks withstand highest operating temperatures without crumbling or loss of shape. The solid woven asbestos tape (no plies) assures uniform friction, maximum safety, extra long life. Thermoid's special resins won't bleed or leave residue on drums. Split-type sleeve prevents 'chucking.' Because the braking surface is pre-ground to accurate limits, no 'running-in' is required.

On original equipment, or when you're making replacements, always insist on Thermoid.

Specify Thermoid Powerflex Rotary Hose and Multi-V Belts for rugged oil field service.



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Panhandle wildcats jump the hump

BY FRANK J. GARDNER

ONE OF THE most active and rewarding wildcat theaters in the country today is pictured here.

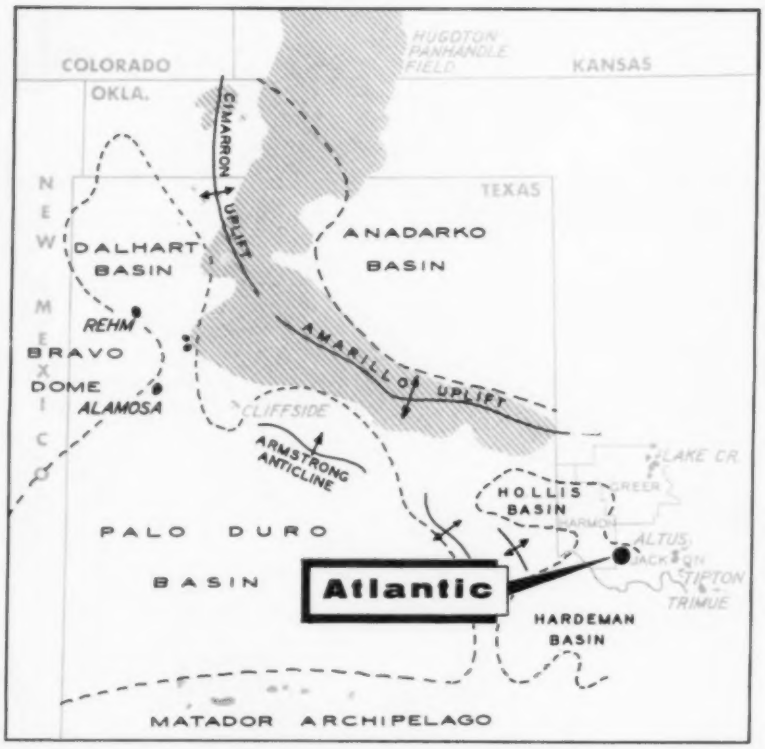
Dominating the picture is the big Palo Duro basin and its two subsidiary basins, Hollis and Hardeman. To the north, the Dalhart basin sweeps up into the Oklahoma Panhandle. In the northeast, the vast Anadarko basin sits astride the Kansas, Oklahoma, and Texas state lines.

An open mind . . . A short 10 years ago, no operator in his right mind would have considered a deep wildcat in the panhandle country. The great Panhandle and Hugoton gas fields had been developed from the Permian, and that was **it.** But along came Sinclair Oil & Gas Co. in 1949 with the discovery of Lips-Mississippian field in northern Roberts County, Texas; this was the first pre-Pennsylvanian oil well in the Texas Panhandle. Though it was later plugged back to Douglas sand (Pennsylvanian) as a gas well, the discovery opened some closed minds. Perhaps a second look at the panhandle was in order. It was.

A couple of years went by with no new strikes. Then Cator field was found in Hansford County, Texas, in February 1951. By 1952, the western Anadarko race was on. Since then, the entire northeastern corner of Texas and all of northwestern Oklahoma has been showered with discovery. The climax cannot be dated, for it's not yet here. But in 1957, in the Texas Panhandle alone, a solid 54 hits were scored out of 159 tries. That's lucrative wildcatting—34%.

Looks over the hump . . . But what of the other basins here? With Anadarko humming, geologists decided it might be worth while to take a look "over the hump" south and west of the Amarillo uplift. It was. In 1954, Rehm field was found in central Hartley County, Texas, and the Dalhart basin had its first oil. In 1957, Shell Oil Co. blasted away a mountain of geological prejudice by finding the first oil in the Palo Duro basin with its 1 Alamosa Ranch in Oldham County, Texas.

Today, two new developments cast discovery shadows over the southern part of Palo Duro. One is an apparent discovery in southwestern Oklahoma. The other is an announcement of a brash new wildcat thrusting its paw out into the depths of southernmost Palo Duro.



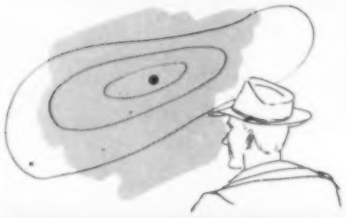
MAJOR STRUCTURAL FEATURES of the five-state panhandle province lend support to the belief that much remains to be learned about the productive possibilities here. Newest development is Atlantic Refining Co.'s indicated success in the Hollis basin in Jackson County, Oklahoma.

To find success . . . In Jackson County, Oklahoma, (flagged on map) Atlantic Refining Co. found commercial oil shows in its 1 Hulett (Section 5-1n-23w), 18 miles west of the nearest production at Altus field. A test of the third Strawn-Pennsylvanian sand at 5,308-70 ft. recovered 110 ft. of black 45° oil and 285 ft. of heavily oil and gas-cut mud. On another test at 5,382-5,426 ft., recovery was 276 ft. of heavily oil-cut mud, half oil and half mud, plus 184 ft. of water.

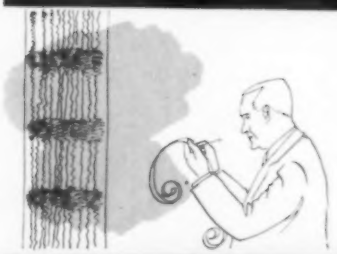
This is the first indication of success this far out into the depths of the Hardeman-Hollis basin, an eastern arm of Palo Duro. Geologists believe the three areas connect in subsurface, but too little drilling has been done to go much beyond believing. Atlantic's well is contributing some gems of information along this line, principally the assurance of multiple sand prospects in the Pennsylvanian section here. It's drilling ahead now below 6,800 ft. after a new test at 6,705-80 ft. had gas to surface in 10 minutes; recovery on the test was 80 ft. of gas-cut mud.

The new wildcat just announced for Palo Duro and too late for the map is Frankfort Oil Co. 1 Sweat; it lies about 1½ miles north of the southern county line in Swisher County, Texas, in the southeast corner of Section 44, Block M-14, D&SE Survey. Here's just one more try at finding oil that must be hidden in this big virgin basin. Keep your fingers crossed.

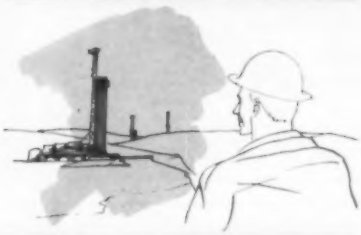
HOW AN OIL FIELD LOOKS



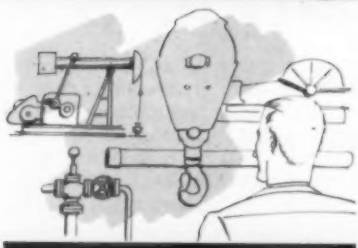
To the geologist



To the geophysicist



To the engineer



To the supplier

To the banker

Here are some helpful hints for geologists and landmen on . . .

How to evaluate an oil field

You can't depend on sure-fire formulas, nor can complex mathematics help very much. Fifty per cent of the answers are based on rule-of-thumb

BY WAYNE SWEARINGEN

SOONER OR LATER, almost every lease that is found productive of oil and gas will go through the banker's hands.

The banker will always want to know the oil and gas reserves of the lease, and if the geologist or landman is well informed, he will find life much easier and perhaps impress the banker that he is a good manager of property.

Petroleum - evaluation engineering, like most technical fields in the oil business, requires a great deal of experience-based judgment. The formulae are few and simple. Probably 90% of the answers are reached without complex mathematics, and at least half the answers are based on rules-of-thumb.

Reserves of oil and gas may be estimated by one of the following methods:

- Extrapolation of performance data
- Analogy
- Pore volume.

We shall pass over the extrapolation-of-performance data method without further comment. That method is well understood in its simple application and too complicated for adequate treatment here in its full meaning and application.

Analogy . . . Nothing is as useful in evaluation as knowledge of similar property. If the estimator has found that production from oil wells in the Arbuckle limestone in the particular area averages 75,000 bbl., that the Tensleep usually yields about 20,000 bbl. per acre, or the recovery from the D-3 is about 100 bbl. per acre-foot, he has tools of great value at his disposal. A "ball-park" number obtained by direct analogy may be the best that can be had in the time allotted. Indeed, the analogy may be the best method even if other approaches are made.

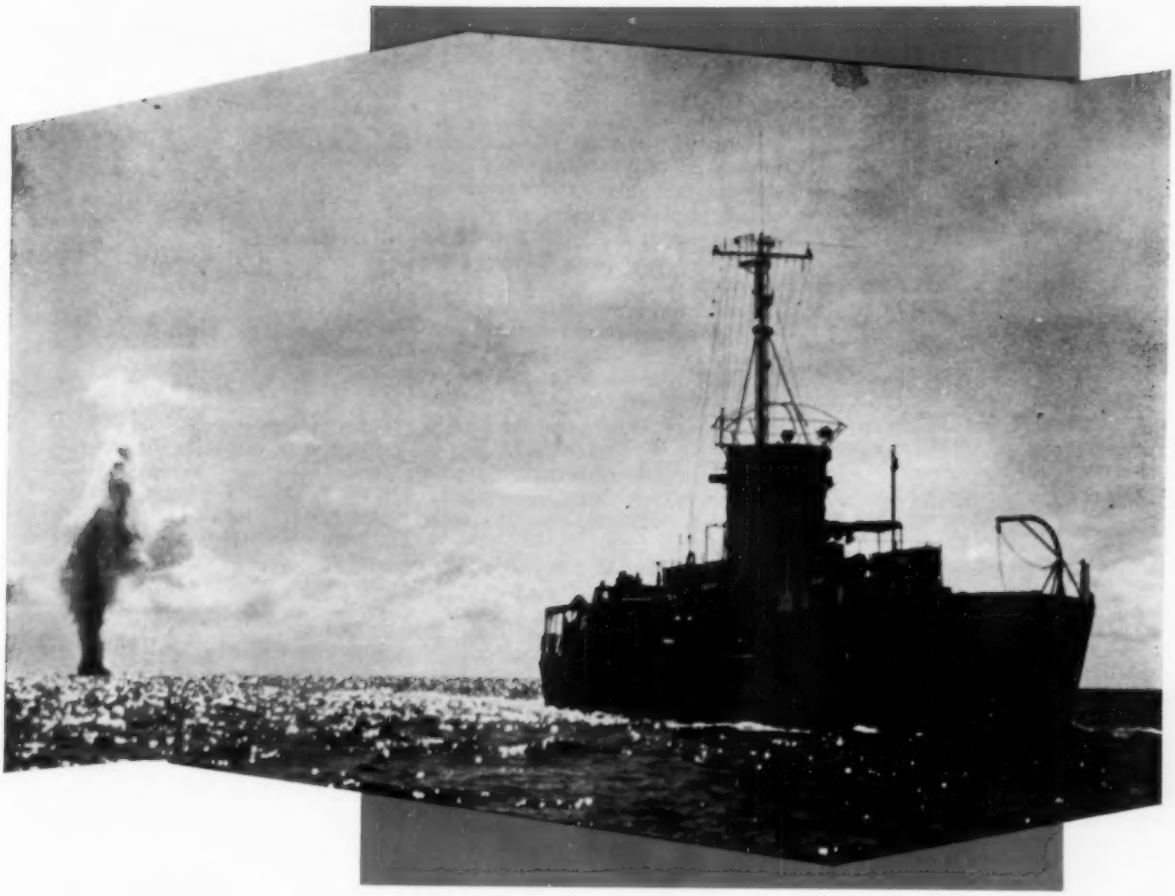
Any geologist or landman can get statistics on actual recovery from some of the older fields and be a walking encyclopedia of analogy data.

An understanding of the geology of the area to be evaluated is essential if one hopes to make the best use of the analogy.

Pore volume . . . This method is most frequently used when the field is new and should always be used as a check. It is the unfortunate truth that the greatest need for the estimate of reserve exists before the wells have been produced long enough to give performance data. There are seven easy steps in any pore-volume estimate. They are:

1. Estimate the net rock volume.
2. Estimate the porous fraction (porosity).
3. Estimate the water-filled fraction (connate water).
4. Estimate the fluid properties.
   (a) Shrinkage to conditions used as units of measure.
   (b) Compressibility.
   (c) Pressure and temperature.
   (d) Extraneous liquids or gases.
5. Select the correct constants.
6. Estimate the recovery factor.
7. Turn the crank!

It is not by accident that the first step is estimating the net rock volume. Great errors are made in this step. The volume required is the net volume of rock that contains oil or gas, and of high-enough permeability to be depleted. (The estimated lower limits of permeability depend on viscosity, type of depletion mechanism, and other factors. Frequently, rock



have ship . . . will search

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THE AUTHOR

The author is a vice president and chief engineer of Alex W. McCoy Associates, Inc., a geological and engineering firm with the home office in Tulsa and regional offices in Denver, Casper and Calgary, Alta. Prior to his present position, he operated as a consulting reservoir engineer and had 6 years experience with the Pan American Petroleum Corp.

of less than 1 md. is not considered "pay" in an oil reservoir to be produced by pressure depletion or waterflood).

Do not include the thickness that was hoped for when the well was drilled.

The standard pore volume formula can be illustrated by two sample problems. The data are shown listed in the sample problems in the same order.

SAMPLE DATA FROM AN OKLAHOMA WELL

Spacing, acres per well	10
Net porous thickness, feet	20
Porosity, per cent	15
Connate water, per cent	25
Bottom-hole pressure, psia.	2,000
Bottom-hole temperature, °F.	100
If oil reservoirs volume factor	1.20
If oil recovery by primary, %	20
If gas compressibility factor, orig.	0.85
Compressibility factor, abdn.	0.95
If gas abandonment b.hp., psia.	200

CONSTANTS

Barrels in 1 acre-foot	7,758
Cubic feet in 1 acre-foot	43,560
Measurements at 14.7 psia. and 60° F. Temperature measured from absolute zero, or —460° F. Thus	100° F. = 560 60° F. = 520

Some normal ranges of recovery are presented. There are a few fields in which the recovery is unusually great or small, and the study of these exceptions will no doubt lead to important discoveries in the mechanics of recovery of oil from rock. Knowledge of the regional geology of the area is helpful in making an accurate early guess at the type of reservoir mechanism most likely to control the recovery.

Remember, very few reservoirs have only one type of reservoir mechanism. For instance, there are many "limited" water drives and "delayed" effects of gravity segration. And, recovery may be affected by rate of production in some fields.

Each valuation expert must develop his own rules-of-thumb. The rule has little value until the user has found how to apply it. The following are some rules-of-thumb found by the author to be useful for most Pennsylvanian sandstone reservoirs in Oklahoma, and to a limited degree to other areas.*

GENERALIZED RANGES IN RECOVERY

Primary recovery—	Per cent
Gas cap blowoff	5 to 15
Volumetric	10 to 25
Gas-cap expansion	20 to 35
Water drive	30 to 60
Gravity segregation	30 to 90

Secondary recovery—	Per cent over volumetric
Gas injection (air or other gas)	20
Waterflood	100
Miscible fluid (liquid or high press. gas)	200
In situ combustion	200

Mining—Nearly total.

RULES-OF-THUMB FOR MOST OKLAHOMA PENNSYLVANIAN SANDSTONES

Reserves:
- Primary oil, bbl./acre-ft. — 10 × porosity
- Gas, M.c.f./acre-ft. — 50 × porosity (per mile of depth)

Reserve of "settled" oil production, bbl.: (Present daily rate — Abnd. daily rate) × (2,000)

Costs: (2,000 to 8,000 ft.)
- Drilling cost, dry hole — $7 per foot
- Comp. well cost, producing gas — $9 per foot
- Comp. well cost, producing oil — $10 per foot
- Operating cost, 2,000 to 8,000 ft.:
  - Gas wells, no fluid — $50/well/month
  - Oil wells, no water production — $150/well/month

Valuation:
- Primary oil — $1.00 to $1.50 per net barrel
- Secondary oil — $0.25 to $1.00 per net barrel
- Fair market value based on these criteria
  - Current income — 20-30 months
  - Future income (payout) — 40-50 months
  - Interest on exposed money — 10-30 per cent before taxes
  - Ultimate return on investment — 2-4 times before taxes
  - Daily net production — $2,500 per barrel

Bank loan:
- Pay back loan when half the reserve is left.
- Pay loan off in 30 months out of 80 per cent of gross income, about $0.90/bbl., or 80 per cent fair market value.

*Credit is given to J. J. Arps of the British-American Oil-Producing Co. for use of his methods in this regard.

Sample Calculations of recovery from one well

(a) If oil, stock-tank barrels:

$$\frac{(10)\,(20)\,(0.15)\,(1-0.25)\,(0.20)\,(7{,}758)}{1.20} = 43{,}500$$

(b) If gas, standard cubic feet:

$$(10)\,(20)\,(0.15)\,(1-0.25)\,\frac{(2{,}000)}{(14.7)}\,\frac{(520)}{(560)}\,\frac{(1)}{(0.85)}\,(43{,}560)$$

Less—

$$(10)\,(20)\,(0.15)\,(1-0.25)\,\frac{(200)}{(14.7)}\,\frac{(520)}{(560)}\,\frac{(1)}{(0.95)}\,(43{,}560)$$

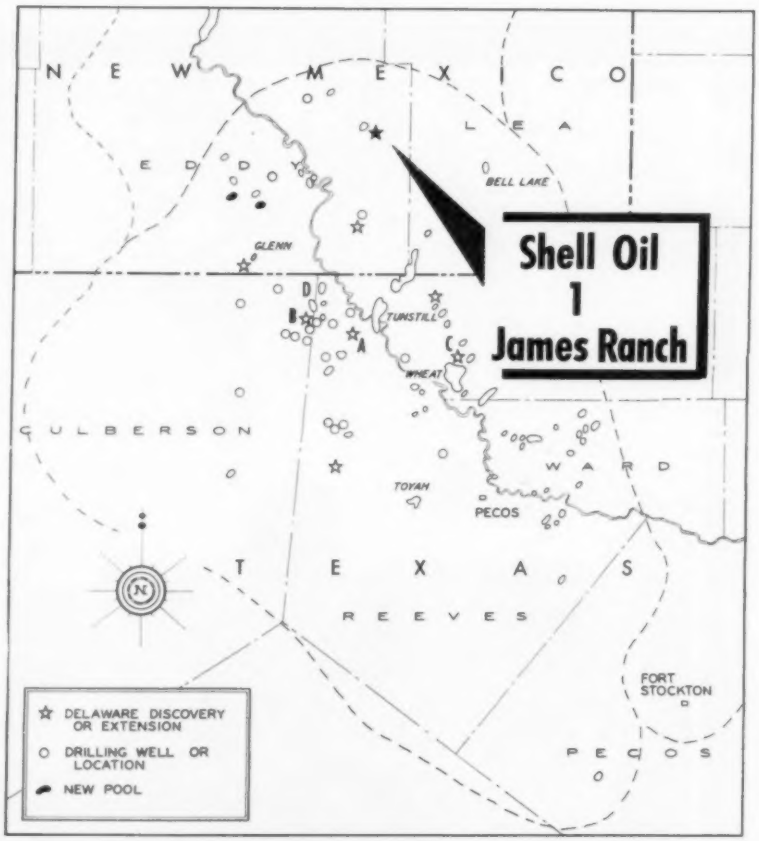
$$= 133 \text{ M.M.c.f.}$$

Shell strike accents Delaware basin activity

DELAWARE BASIN exploration during first quarter 1958 has been both heavy and productive. The Delaware sand accounts for the greater share of drilling, but Shell's gas-distillate strike in Eddy County, New Mexico, lends encouragement to the deep, pre-Permian explorers.

Shell Oil Co., drilling in the New Mexico portion of the basin, has completed a commercial well from the Atoka section of the Pennsylvanian, and is testing another deep prospector in the same general area, but nearer the northwestern rim of the basin.

Less spectacular but of importance reservewise are the many Delaware sand pools cropping up in the Texas portion of the basin. The Permian Delaware Mountain group of sands and shales underlies most of this huge 10,000-sq.-mile basin. In depth the Delaware lies from 1,000 ft. on the west side of the basin to about 5,000 ft. on the east.



DISCOVERY and drilling picture map of the West Texas-New Mexico Delaware basin.

Atoka discovery . . . Shell Oil Co. 1 James Ranch has been completed as a gas-condensate well from the Atoka section of the Pennsylvanian. Calculated open-flow potential was 9 M.M.c.f.d. of gas, plus 56°-gravity condensate at the ratio of 86,000:1.

Final perforations were between 12,920-29 ft., where the well made the following flow tests: Gas at the rate of 7,500 M.c.f.d. plus 22.8 bbl. of condensate, through ½-in. choke; 7,038 M.c.f. of gas and 8.72 bbl. of condensate through 24/64-in. choke. Tubing pressure was around 5,000 psi.

Shell 1 James Ranch, 36-22s-30e, is approximately 25 miles east and slightly south of Carlsbad, in Eddy County. It is 2 miles southeast of a lone Delaware sand producer.

Depth record, too . . . The 1 James Ranch was drilled to 17,555 ft., surpassing the old state depth record by 713 ft., held by Phillips Petroleum Co. 6 Lea-Mex., 23-17s-33e, in Lea County.

At this writing it isn't known if 1 James Ranch reached the Precambrian, but tests were made throughout the Mississippian, Devonian and Ellenburger. The Mississippian and Devonian flowed gas at the rate of from 1-3 M.c.f. daily and the Ellenburger, around 17,500 ft., returned gas-cut mud and salt water.

Second test drilling . . . Shell 1 Big Muddy Unit, a Devonian wildcat, drilled to 14,059 ft. total depth, then set 5½-in. casing at 11,698 ft. to try for completion as a Strawn discovery. Location is 10 miles east of Carlsbad in 36-21s-28e.

This test recovered a small amount of oil from the Delaware sand around 3,800 ft., and made gas on several drill-stem tests in the Pennsylvanian. Best of these was at the rate of 1,250 M.c.f.d. at 11,361-11,447 ft. It also had a slight mist of oil.

Basin shallow tests . . . A look at the accompanying map shows the central portion of Delaware basin to be studded with Delaware discoveries. Circles represent drilling wells, or locations. Since most of these are shallow tests and can be drilled in a few days' time, it should be pointed out that these were reported active as of the first week in March. Many of them will have been completed by this publication, but it presents a good picture of exploration over the first quarter this year.

BY CARL HOOT
District Editor

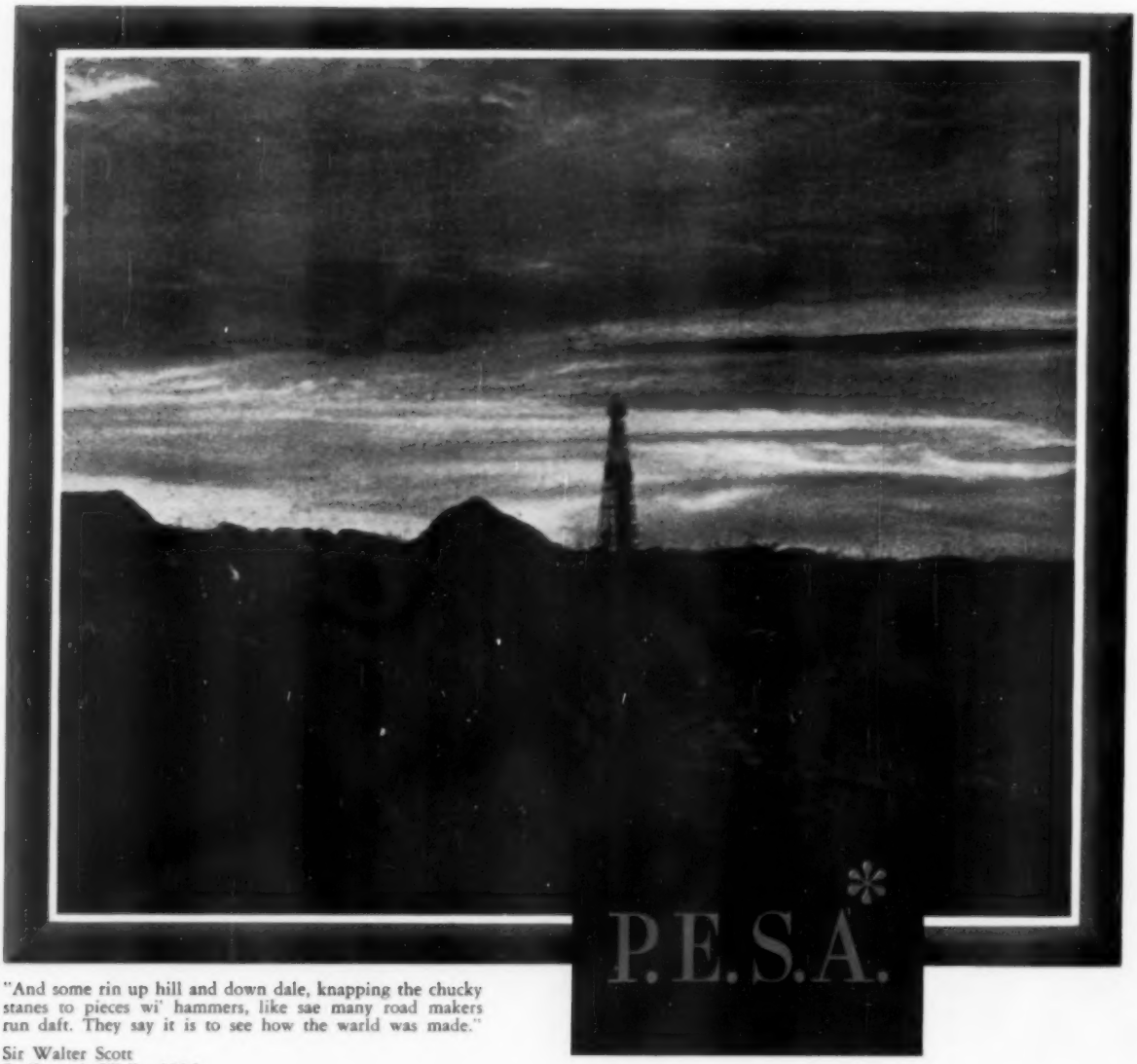
Here are a few of the recent Delaware sand discoveries. Initial production figures are typical for Delaware wells.

W. D. Thorn et al 1 TXL (A on map), southwest of Tunstill field, in northern Reeves County. Flowing potential was 90 bbl. of 41°-gravity oil a day through 8/64-in. choke, from 7 ft. of sand at 3,029-36 ft.

Ford, Chapman & Associates and W. D. Thorn 1-3 TXL "A," (B on map), 2 miles south of Geraldine field in the northeast corner of Culberson County, had somewhat heavier production. Initial potential was 280 bbl. of oil a day through 14/64-in. choke from pay at 2,580-89 ft. Gravity was 44°. Each of these wells was completed with a small fracture treatment.

Several extension wells have been reported in the Grice field area of

Where In The World Will They Find Oil Next?



"And some rin up hill and down dale, knapping the chucky stanes to pieces wi' hammers, like sae many road makers run daft. They say it is to see how the warld was made."

Sir Walter Scott
St. Ronan's Well—1824

We have evidence of geologists at work in 1824. It was inevitable that the "rock breakers" would one day develop sciences that would be useful in the search for oil. Present day methods, however, would not be recognized by early day proponents of the art. And much credit must be given those who spent their lives in geological interpretation.

The practice of formation and surface feature study was followed by the torsion balance, the gravimeter, refraction and reflection seismic techniques. The first geophysical prospect (torsion balance) to be proved in the United States was on the Nash Ranch in Fort Bend County, Texas. A year later, the first seismic discovery was made at Orchard, Texas.

Since that time, geophysical crews have traveled the length and breadth of the world in the search for indications of gas and oil.

And wherever oil has been found, PESA Supply, Service and Manufacturing members have made their contributions to the development of oil fields throughout the world.

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57—104

PROUD TO BE PART OF A PIONEERING INDUSTRY

north-central Loving County. One of these was Sinclair Oil & Gas Co. 1 Dorothy Johnson (C on map), east of Tunstill field. Flowing potential was 187 bbl. of oil a day through 18/64-in. choke from perforations at 4,565-75 ft.

AT RIGHT is The Oil and Gas Journal's pay zone correlator for Southeast New Mexico and West Texas fields. The Delaware Mountain group has been divided into the five member names most widely used at this time.

Active field . . . One of the most active (Delaware) spots is Geraldine Ford field (D on map) in northeast Culberson County. Initial potentials, following fracture treatment, run from 100-250 bbl. a day, from sand pay between 2,500-2,600 ft.

From these discoveries and the over-all activity, it appears the Delaware basin may be in a new phase of development. The difficulty with seismic readings is still present. Great depths necessary to reach below the Permian beds, lost circulation problems and high-pressure gas pockets are just a few of the stumbling blocks facing drillers in the basin, but the great white spaces on field maps are being filled with a few shaded areas, a considerable change in just the past few months.

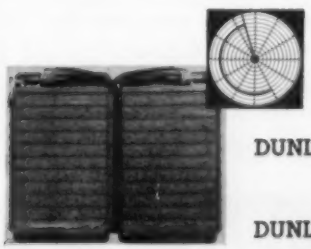
Washington Drilling Confined to Two Tests

DRILLING in the one-well oil state of Washington was confined to two tests far removed from the state's only field.

One was Standard Oil Co. of California, Western Operations, Inc. 1 Rattlesnake Hills unit which was drilling ahead below 9,400 ft. The other was J. W. Tanner 1 Sylvester Gunther in Lewis County. It was drilling below 350 ft.

Permian Basin Correlator

SE New Mexico			West Texas	
PERIOD	GROUP	MEMBERS	GROUP	MEMBERS
Triassic				
PERMIAN	Dela. Mtn.	Delaware Seven Rivers Queen Grayburg San Andres		Tansill Yates Seven Rivers Queen Grayburg San Andres
		Glorieta (Holt, San Angelo, Paddock)	Leonard	Glorieta (Holt, San Angelo, Paddock)
	Yeso	Clear Fork (Fullerton, Tubb) Wichita Albany	Leonard	Clear Fork (Fullerton, Tubbs) Wichita-Albany
		Wolfcamp (Abo-Hueco)	—?—	
			Wolfcamp	Spraberry Wolfcamp Dean
PENNSYLVANIAN		Upper		Cisco
		Middle		Canyon
		Lower		Strawn
				Bend (Atoka)
MISS.		Miss. limestones Woodford shales		Barnett shale Chappel li. Woodford
Devonian		(Devonian)		(Devonian)
Silurian		Fusselman		Fusselman
Ordovician		Montoya McKee Waddell Connell	Simpson	Montoya McKee Waddell Connell
		Ellenburger		Ellenburger
Cambrian		?		?
Pre Cambrian				



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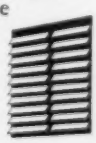

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Both Standard and Super Rib-Top are available at your oil field supply house.

For Toughest Drives Use *Super* Rib-Top

With 40% greater horsepower capacity, Super Rib-Top easily handles overloads. Fewer belts and narrower sheaves solve space and weight problems.

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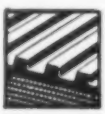
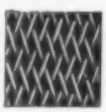
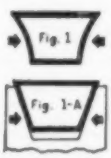


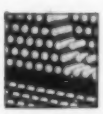
1. Stabilizing ribbed tops (U.S. Pat. 2548135) are exclusive with Gates. They dampen vibration, protect top of belt from damage, keep belt running smoothly over idler-equipped mud pump drives with no side whip.



2. Flex-Weave Cover (U.S. Pat. 2519590) A Gates exclusive: provides greater flexibility with far less stress on fabric. Cover wears longer . . . increases belt life . . . more power available to driven machine.



3. Concave sidewalls (U.S. Pat. 1813698) Concave sides (Fig. 1) increase belt life. As belt bends, concave sidewalls become straight, making uniform contact with sheave groove (Fig. 1-A). Uniform contact means less wear on sides of belt . . . far longer belt life.



4. Tougher, more resilient cords are able to absorb the severe pulsations of mud pumps; easily handle peak loads.

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Geologists discuss exploration trends

THE ECONOMIC operational, research and theoretical aspects of oil exploration, as well as the International Geophysical Year program will be discussed in technical sessions of the eleventh midwestern exploration meeting in Tulsa April 17-18.

Cosponsored by Geophysical Society of Tulsa and Tulsa Geological Society, the meeting is expected to attract 500-600 geophysicists and geologists. Under the general chairmanship of W. M. Erdahl, Skelly Oil Co. chief geophysicist, the meeting committee has assembled a program comprising over 30 papers.

Although the general theme is "Exploration Trends in the Mid-Continent," the program nevertheless offers topics ranging from offshore problems and techniques to those encountered in complex montane areas. Reports will cover the recent developments in tools and methods for obtaining and interpreting subsurface information.

PLANS for the eleventh midwestern exploration meeting in Tulsa on April 17-18 are made by, left to right, C. W. Alcock, technical program cochairman; Frank E. Brown, arrangements chairman; Ed H. Weltsch, finance chairman; and W. M. Erdahl, general chairman.

As added and timely interest, two internationally known geophysicists, will report on their participation in the IGY. Father Daniel Linehan, S. J., director of Boston College's Weston Observatory, conducted extensive seismological experiments in Antarctica; Dr. George P. Woollard, professor of engineering geology and geophysics at the University of Wisconsin, will discuss the objectives and some preliminary results of the IGY gravitational and seismological programs.

Supertight Paradox wells not so hot

DATA on two supertight wildcats in the Paradox basin of southeastern Utah were released last week.

Here are the results of two Continental Oil Co. tests northwest of Aneth area production in San Juan County:

. . . Continental's 1 Federal-Miller, C NE NE 8-38s-22e, is an indicated discovery. Pipe was run to 6,506 ft., perforations were made at 6,294-6,324 ft., and swabbed dry after acide treatment. After reacidization the well flowed 10 bbl. of fluid, mostly oil, and then was swabbed for a recovery of 120 bbl. of oil with no acid water. On 10-hour test, the swab got 26 bbl. of oil, and then the company shut the well in for 14 hours. Swabbing then got 4 bbl. of oil in 5 hours. Continental has shut the indicated strike down temporarily. Total depth is 6,510 ft., top of the Hermosa-Pennsylvanian at 5,239 ft.; Paradox-Penn at 6,095 ft.

. . . The other wildcat, 1 Federal-Carter, C SE NE 34-38s-22e, is going to be abandoned. Total depth is 6,532 ft.

The two wildcats stirred Paradox basin oil circles several weeks ago when rumors had it that two discoveries were in the making. Both tests are 6-14 miles northwest of nearest Paradox basin production. Success would have cracked open a huge new area of Paradox basin possibilities.

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At the base station, depending on your range of operations, there are two sets to choose from, the 100 watt six channel TR 242, and the 150 watt nine channel TR 222, with frequency ranges of 2-5 mc and 2-6 mc respectively.

For the vehicle, the rugged, shock mounted 50 watt single or dual channel TR 245. It's a lightweight, compact unit with a frequency range of 1.5 to 8 mc. With a low power drain of only 2.5 amps (stand-by on 12 V systems) the TR 245 won't sap your vehicle battery.

For the foot party, a pint-sized roughneck. It's a two watt 23 pound packset, the TR 246, with a frequency range of 2-8 mc.

Wrap up your field communication needs in the Kaar package, the only complete system made. For additional information, write to us.

Illustrated is the 50 watt TR 247. Packed in a rugged fiberglas carrying case, it is ideal for field camp use. Included in the design are provisions for time break circuitry for geophysical exploration data transmission.

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Use the Type U singly, or in tandem leaving off the roller cap on the lower saver. When you do need them, get Guiberson replacement rubbers packed two pair to a blue and yellow box.

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Available in 2" or 2½" EUE 8 round double pin sizes and 3" 8V line pipe or 3" EUE 8 round double pin sizes for ⅜"-⅝", ½"-⅝" or ¾"-1" wire line.

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Fuson may be new producer

THE Rocky Mountains may have a new producing zone—the Fuson of Lower Cretaceous age. Carter Oil Co. and Mobil Producing Co. 1 Wheatley-Government in the Belfry area northwest of Clarks Fork field in Carbon County, northern Big Horn basin, Montana, flowed 1,121 M.c.f. of gas per day and 196 bbl. of condensate on a 24-hour test. The test was on 13/64-in. choke.

Perforations in the Fuson are at 9,843-63 ft. A drill-stem test at 9,844-80 ft. got more than 6 M.c.f.d. of gas. Another zone in the well, the Peay, also got gas and condensate at 8,649-94 ft.

The Fuson has had shows before in this area of the Rockies, but there is no commercial production from the sand. It belongs to the Cloverly Group and lies between the Lakota and Dakota. If the well is officially completed as a Fuson producer, a new pay for the Rocky Mountain province will be scored.

New Morrow Gas Production in Texas

New Morrow gas production was opened in Ochiltree County, Texas Panhandle, by Horizon Oil & Gas Corp. of Amarillo.

The 1-746 D. C. Wilson is a Morrow - Pennsylvanian gas producer at 8,339-46 ft., flowing 10,800 M.c.f.d. plus 6 bbl. of distillate on absolute open-flow test. This new pool opener is 8 miles southeast of Perryton, Tex., and 4 miles southwest of Perryton field in the central part of the county. Location is in Section 746, Block 43, H&TC Survey.

New field stimulates Western Kentucky

WESTERN KENTUCKY'S best new discovery area is in Hopkins County, 1 mile northeast of Nortonville.

The new field, now labeled Oak Hill West, opened last June, has 17 oil producers, all with production gages up to 130 bbl. per day. Production is from the Tar Springs (Jett) sand of Mississippian age. All but two wells in the new field produce from this sand.

Stouder Drilling Co. and Ashland Oil & Refining Co. have completed 15 wells in the field, while Pure Oil Co. has 2. Two of the Stouder and Ashland wells produce in the upper McClosky and O'Hara, respectively. The Tar Springs zone is at 1,525-50, while the upper McClosky is at 2,155-69 ft.; the O'Hara is at 2,068-73 ft.

Hummingbird makes small Ordovician well

WESTERN CANADA'S first Ordovician oil discovery, Imperial Oil, Ltd., 1 Hummingbird in southern Saskatchewan, has been officially completed for a pump potential of 102 bbl. of fluid per day, 40 per cent oil.

The important wildcat, located in LSD 6, 13-2-19w2, 25 miles northeast of Outlook field, important Williston basin pre-Madison producing area, has been closely watched for several months since it first indicated production from the Ordovician. The producing interval is at 9,870-79 ft.

Successful completion of the Hummingbird discovery well is one of the most important wildcat happenings in Canada this year. The well establishes a northern anchor to the huge triangle of pre-Mississippian production in the Williston basin, bounded on the northwest by Outlook, on the east by Beaver Lodge, and on the south by the Cedar Creek anticline fields of Montana.

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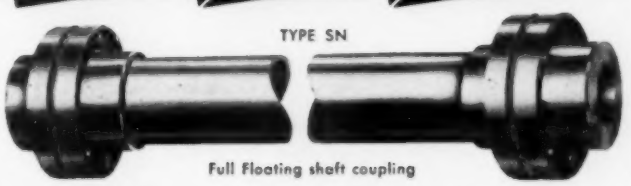

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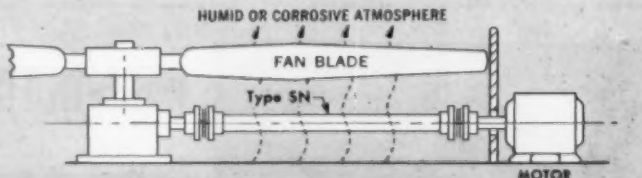

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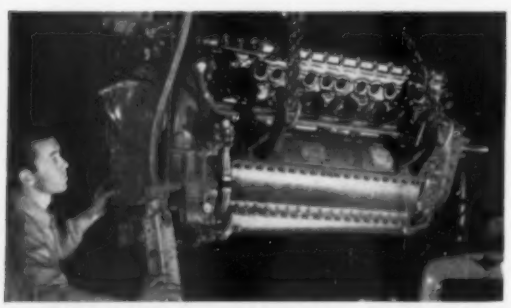
DOWELL RECENTLY PERFORMED THIS RECORD-BREAKING HIGH-INJECTION-RATE TREATMENT AVERAGING



IN ALL AREAS now, powerful, remote-controlled Allison-powered pumpers are available to make high-injection-rate fracturing economical. This mighty aircraft engine, heart of the pumping unit, has a maximum rating of 1500 horsepower and delivers 600 hydraulic horsepower from Dowell's high volume pumps.

HIGH-INJECTION-RATE FRACTURING BY

Many operators are going to high-injection-rate fracturing for one simple reason. It gives them more oil for their money!

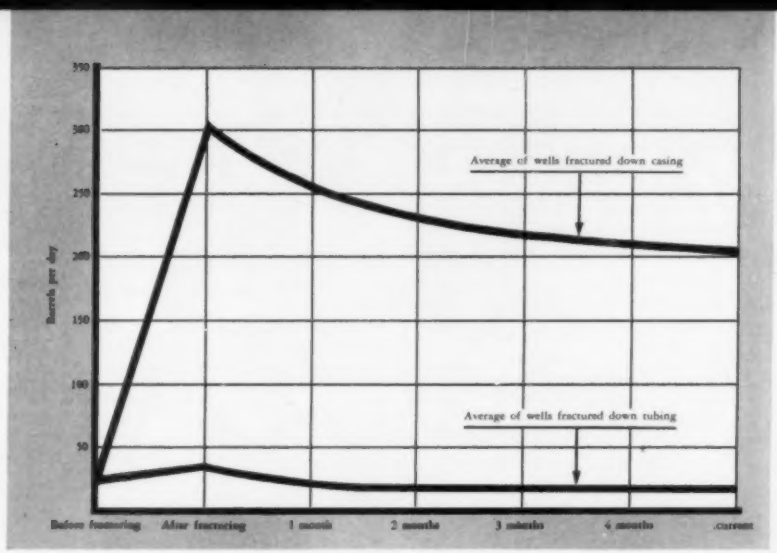
At first this may seem strange. More equipment is required for the treatment. The tubing string may have to be pulled.

When all factors are taken into consideration, the cost per job is considerably higher—but the results are often startlingly better.

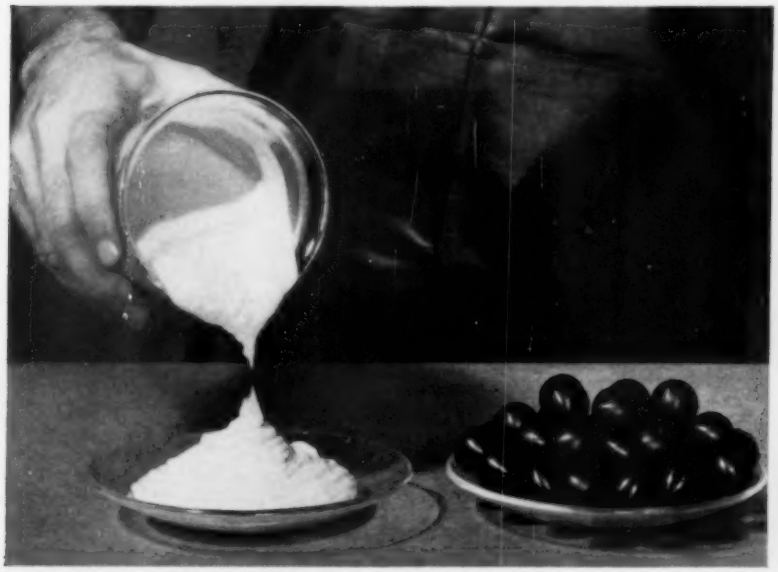
Many wells that do not respond well to fracturing down tubing show excellent results when tubing is pulled and injection rates are increased. The graph on the next page is an example of this fact as proved in one producing field.

To help make high-injection-rate fracturing practical, Dowell

71 BBLS./MIN. WITH 6250 HHP.



IN YOAKUM COUNTY, WEST TEXAS, a study was made by oil company engineers, comparing the results of high-injection-rate fracturing down casing with low-injection-rate fracturing down tubing. This study showed that casing jobs yielded far better results. The average initial increase was over 12 times as great. More important, however, production held up far better as shown on the graph.



NEAR SHREVEPORT, LOUISIANA, as well as other areas, some operators use Fixafrac® or ball sealers to improve the effects of high-injection-rate fracturing. Temporary plugging materials help spread the force of the treatment over the entire face of the pay for better results.

DOWELL-FOR GOOD ULTIMATE RECOVERY

developed the remote-controlled pumper powered by an Allison aircraft engine. This is still the most powerful unit—pound for pound—in general use.

Take advantage of the experience Dowell has accumulated in this service. For full information on the advantages of high-injection-rate fracturing, call any of the 165 Dowell service points in the United States and Canada; in Venezuela, contact United Oilwell Service. Dowell Incorporated, Tulsa 1, Oklahoma.

Services for the oil industry DOWELL

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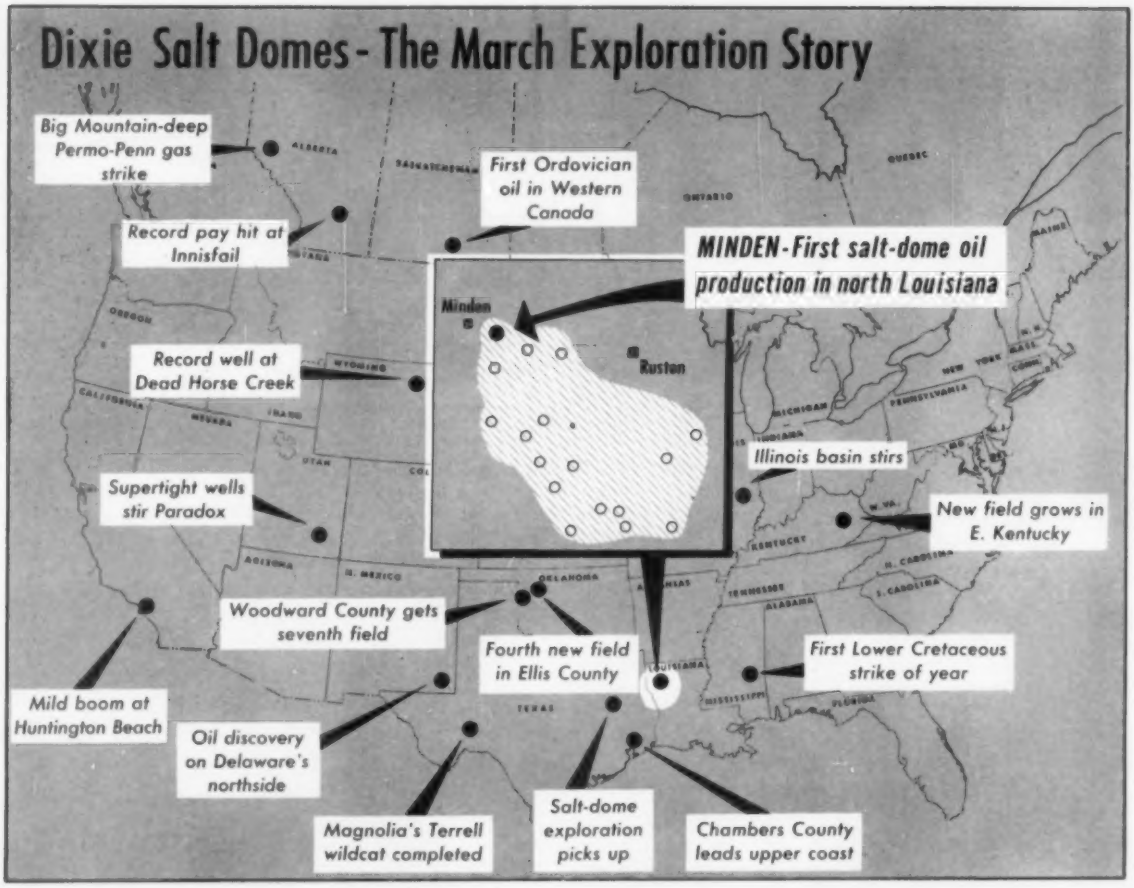
PULLING TUBING can be one of the greatest aids to high-injection-rate fracturing. Many operators have found that the cost of pulling tubing amounts to only a small per cent of the total cost of fracturing. Yet, the production increase sometimes is more than twice as great.


Dixie Salt Domes - The March Exploration Story
Big Mountain-deep Permo-Penn gas strike
First Ordovician oil in Western Canada
Record pay hit at Innisfail
MINDEN - First salt-dome oil production in north Louisiana
Minden
Ruston
Record well at Dead Horse Creek
Illinois basin stirs
Supertight wells stir Paradox
New field grows in E. Kentucky
Woodward County gets seventh field
Fourth new field in Ellis County
First Lower Cretaceous strike of year
Mild boom at Huntington Beach
Oil discovery on Delaware's northside
Magnolia's Terrell wildcat completed
Salt-dome exploration picks up
Chambers County leads upper coast

North Louisiana marks first salt-dome hit

THE SOUTHLAND took over March exploration news with North Louisiana getting its first oil production on an inland salt dome.

Discovery of oil on Minden dome in Webster Parish is the second step in tapping production on North Louisiana's 17 salt domes—the first step was made in 1957 on the same dome when Pan American Petroleum Corp. completed a gas-condensate discovery in Lower Cretaceous-Paluxy sand.

Salt barrier cracked . . . Pan American Petroleum Corp. dually completed its 1 Lee on the Minden dome, 30 miles northeast of Shreveport, in the Paluxy sand, writing another chapter into the salt-dome story of the Gulf Coast plain.

This first oil producer on an inland salt dome in the region flowed 201 bbl. of oil in 14½ hours from 7,386-94 ft. and swabbed and flowed 88 bbl. in 24 hours from 6,948-55 ft. The new oil strike is about 3 miles from the Anna Hudson gas-condensate discovery on the same dome.

Interest in the potentialities of inland salt domes revived about 2 years ago in East Texas when British-American Oil Producing Co. found deep Cretaceous production on the Hainesville salt dome. That discovery set off a wave of leasing and salt-dome talk across all of East Texas, North Louisiana, and southern Mississippi—wherever a dry salt dome was known to exist. After the Hainesville strike, a second success was scored at Bethel dome in Anderson County, and East Texas began to take a long look at its 16 dry domes.

North Louisiana's salt-dome basin with its 17 domes is now fast becoming an enticing spot for wildcatters. This region has lacked exploratory success in recent years—its salt domes may be the answer. Where to from Minden now?

. . . East Texas. March wildcat news included additional salt-dome exploration. A second gas well was brought in at Bethel dome, and wildcats began probing on the Oakwood and Butler domes. The second gas well at Bethel is The Texas Co.'s 1 G. B. Givens, ½ mile south of the Rodessa gas discovery in the field.

BY JOHN C. McCASLIN
District Editor

Regional News

Widespread exploratory success was reported in March in Texas, Mississippi, Illinois, eastern Kentucky, Oklahoma, California, the Delaware, Paradox, Powder River, and Williston basins, and in Alberta.

In Texas . . . The upper Texas Gulf Coast and the far west Val Verde basin figured highly in the month's exploration of Texas soil.

Magnolia Petroleum Co. and Western Natural Gas Co. completed their spectacular dual gas discovery in one of the state's least-explored areas and

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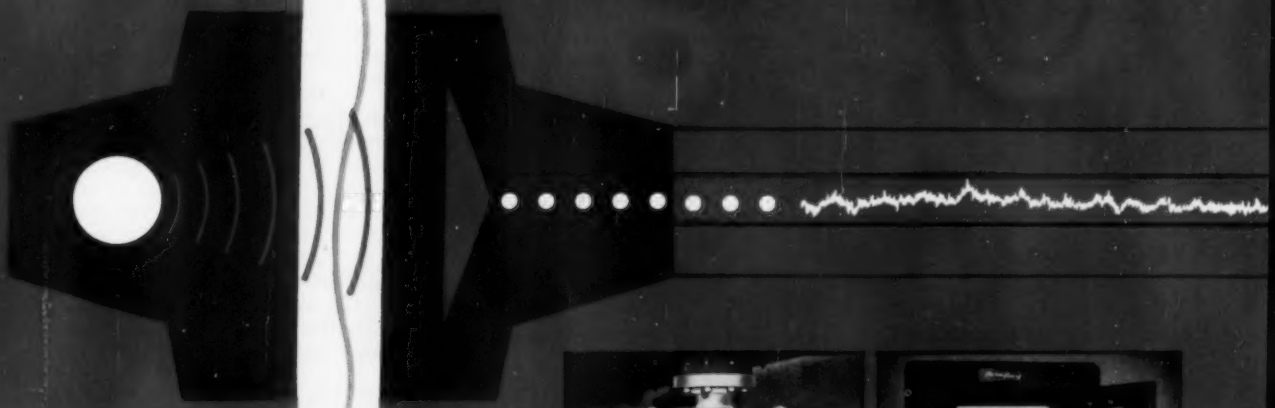

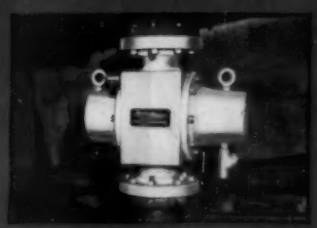

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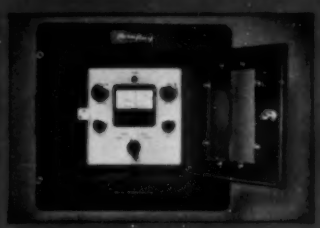

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are ready to begin another 15,000-ft test in the same locale.

The 1 Brown-Bassett in the Val Verde basin of far southwestern Texas was finaled flowing 20,650 M.c.f.d. of gas from Silurian perforations at 12,387-12,446 ft. This is the first pre-Pennsylvanian gas strike in Terrell County.

New exploration in Chambers County on the upper Gulf Coast of Texas is resulting in a succession of significant discoveries and extensions, making it the busiest area on the coast. The most recent new strike is a 1-mile extension of the expansive Fishers Reef field, offshore in the upper arm of Galveston Bay. This extension is southeast of production, where Humble Oil & Refining Co. completed its 50-C Galveston Bay for 318 bbl. of oil per day from a Frio sand and 27 M.M.c.f.d. of gas.

Other active areas are Robinson Lake field on the south bay shore of the county, North Willow Slough in the eastern inland portion of the county, and Stowell field in the northeast corner of the county. At month's end the play was running fast and furious across the line in Jefferson County.

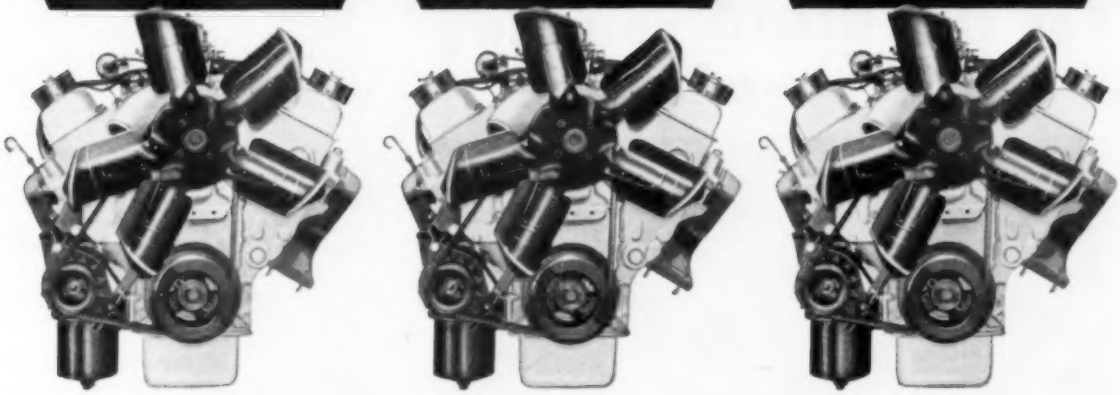
In Mississippi . . . South Mississippi got its first Lower Cretaceous field of the year, bringing to 18 the number of fields producing oil or gas in this deep section. Larco Drilling Co. et al found 216 bbl. of oil per day at a wildcat 6 miles northwest of Raleigh in Smith County, 8 miles northwest of production. Pay is the Rodessa sand at 10,969-72 ft. The new pool is called Boykin Church.

In Illinois . . . The Illinois basin, quiet for many months, is busy with one of its best new strikes in some time. New Gila field in Jasper County, opened in January, has a dozen good Rosiclare and McClosky-Mississippian producers. Fast development promises a field of good size.

In Kentucky . . . In western Breathitt County, about 5 miles west of Jackson, considerable drilling excitement is reported following the completion of Creech 1 Gabbard as a 125-bbl. per day oil well in the Corniferous lime at 1,736 ft. Drilling is mainly on Puncheon Camp Creek where 10 rigs are exploiting this first discovery of importance in eastern Kentucky in many years. The north extension well was reportedly making more than 100 bbl. per day at month's end.

In the Delaware . . . Shell Oil Co., drilling in the New Mexico portion of the vast Delaware basin, completed

FORD 401 cu. in. | **FORD 477 cu. in.** | **FORD 534 cu. in.**



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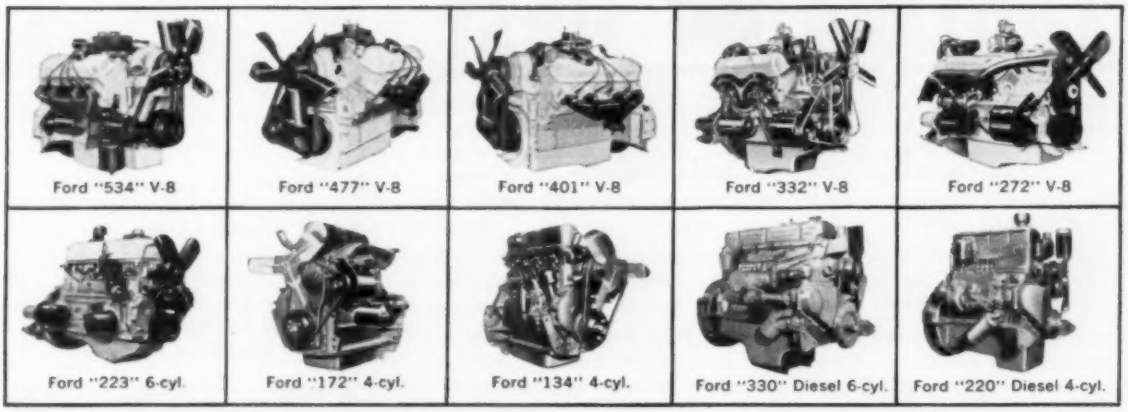

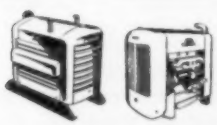

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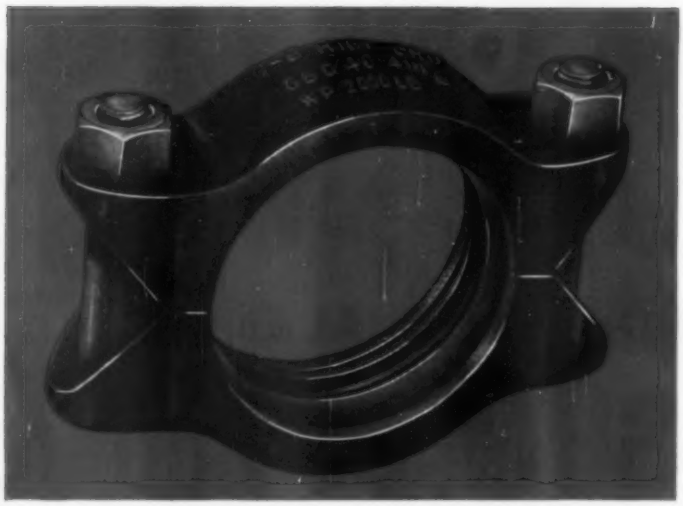

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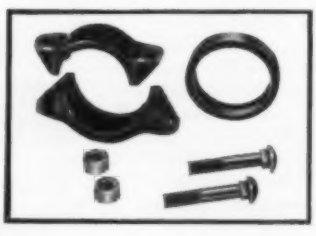

GUSTIN-BACON Manufacturing Company

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an important Atoka - Pennsylvanian gas-condensate discovery. The well flowed 9 M.M.c.f.d. of gas plus condensate. The 1 James Ranch is about 25 miles southeast of Carlsbad. Its importance is that it is another pre-Permian discovery in the deep portion of this sparsely productive basin which has become one of the great exploratory question marks of the last few years. Of all the big basins of the nation, the Delaware has guarded its secrets the closest.

In Alberta . . . Innisfail and Big Mountain Creek headed western Canada exploratory success in March.

- A record pay thickness of 196 ft. was tapped at Hudson's Bay 9-10 Innisfail. This Devonian reef D3 field has 26 producers and 10 rigs busy on development work. Location is 60 miles north of Calgary.
- The deepest Permo-Penn gas production in the province was opened at Triad Oil Co. A-1 Big Mountain Creek, a Grande Prairie area wildcat, southeast of the Fort St. John area of British Columbia. The discovery flowed gas up to 13 M.M.c.f.d. from 10,444-10,504 ft.

In Powder River . . . The best producer to date in Wyoming's Dead Horse Creek field is The California Co. 7 Government, Campbell County. The operator pumped 459 bbl. of oil per day from Parkman-Mesaverde Cretaceous perforations at 6,718-46 and 6,776-82 ft. The development of Dead Horse Creek field is one of Wyoming's big exploratory stories of the past few months.

In Paradox . . . Continental Oil Co. has two reportedly successful wildcats 8 and 14 miles northwest of present basin production in San Juan County, Utah. The supertight holes are 1 Federal-Miller and 1 Federal-Carter. No official information has been released on these rumored strikes.

In Williston . . . Western Canada's first Ordovician production was officially opened at the Imperial Oil Hummingbird wildcat 25 miles northeast of Montana's Outlook field in Saskatchewan. The wildcat pumped 102 bbl. of fluid per day, 40% oil, on completion test. This discovery becomes a northern anchor to the vast area of Williston now being probed for pre-Mississippian production. The area is bounded on the west by Outlook, on the east by Beaver Lodge, and on the south by the Cedar Creek anticline fields.

In Oklahoma . . . Northwestern Oklahoma continues to grow as an impor-

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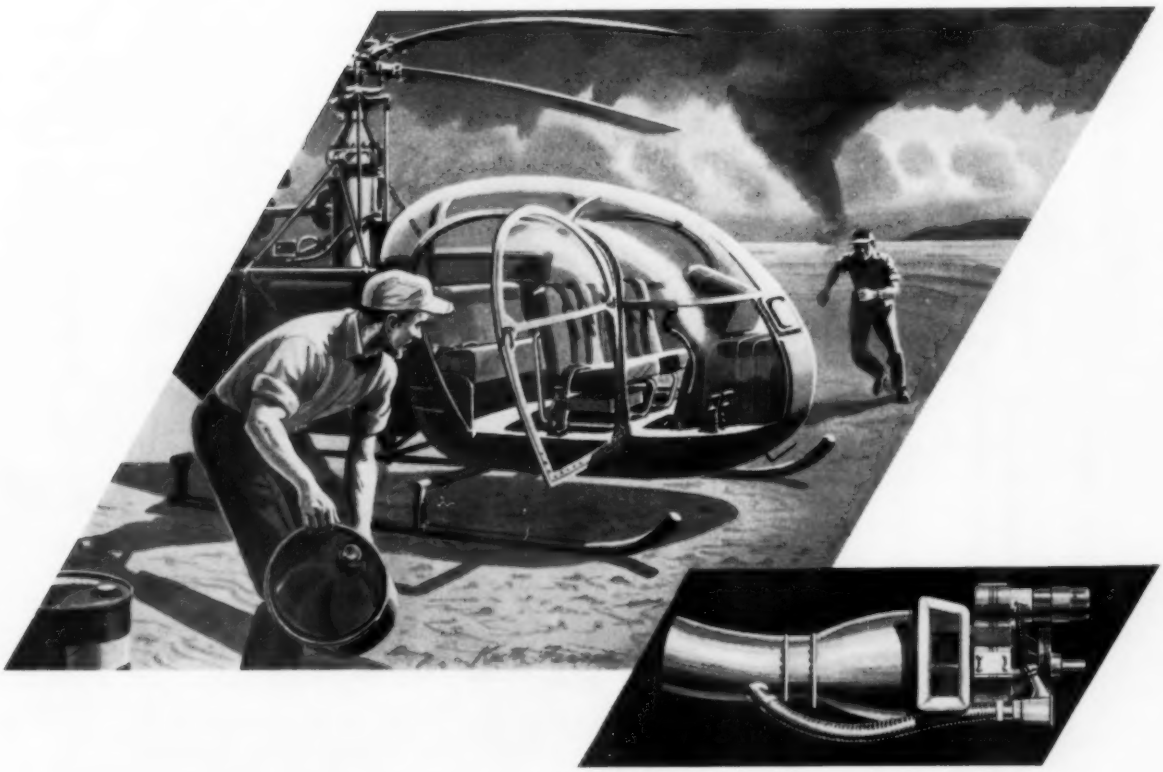

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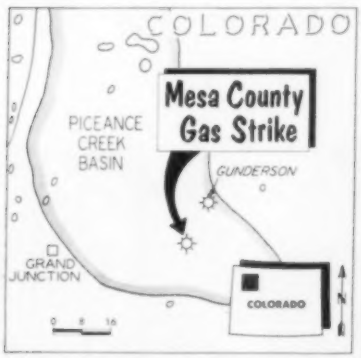
tant new oil and gas province. Calvert Drilling Co. opened Woodward County's seventh field at 1 Young. This new field is a Morrow gas producer (Pennsylvanian).

Nearby Ellis County now has four producing areas as a result of Pan American Petroleum Corp.'s success at 1 Schoenhals, 4 miles northwest of Arnett. Production is gas-distillate from the Morrow. This is Pan American's third discovery in the county. Shell Oil Co. is developing the county's first producing area at Northeast Catesby.

In California . . . A prolific new pool discovery by W. J. Hamilton in the north area of Huntington Beach field, Orange County, has spurred a mild drilling boom which shows nine rigs working.



THE PICEANCE CREEK basin of northwestern Colorado has a new gas discovery at a remote wildcat 12 miles from production in Mesa County.

Colorado hits gas In new location

COLORADO'S Piceance Creek basin has a new far-removed wildcat discovery at Nebraska Drillers 1 Government-Mickelson in S½ SW SW 15-11s-94w, Mesa County.

The gas discovery, long reported as a tight hole, is now shut in for further tests when spring comes to the mountain country. The latest gage reported is 1,420 M.c.f.d. through tubing. The Mesaverde - Cretaceous discovery flowed gas from perforations at 5,712-34, 5,750-74, and 5,776-5,806 ft. Initial tests got as much as 2,900 M.c.f.d.

This rank new gas area is 12½ miles southeast of Mesa, Colo., in an area of no previous drilling. The closest production is at Union Oil Co.-Tennessee Gas Transmission Co. 1 Gunderson, a 1957 discovery in NE NE NE 20-9s-93w, which made 385 M.c.f.d.

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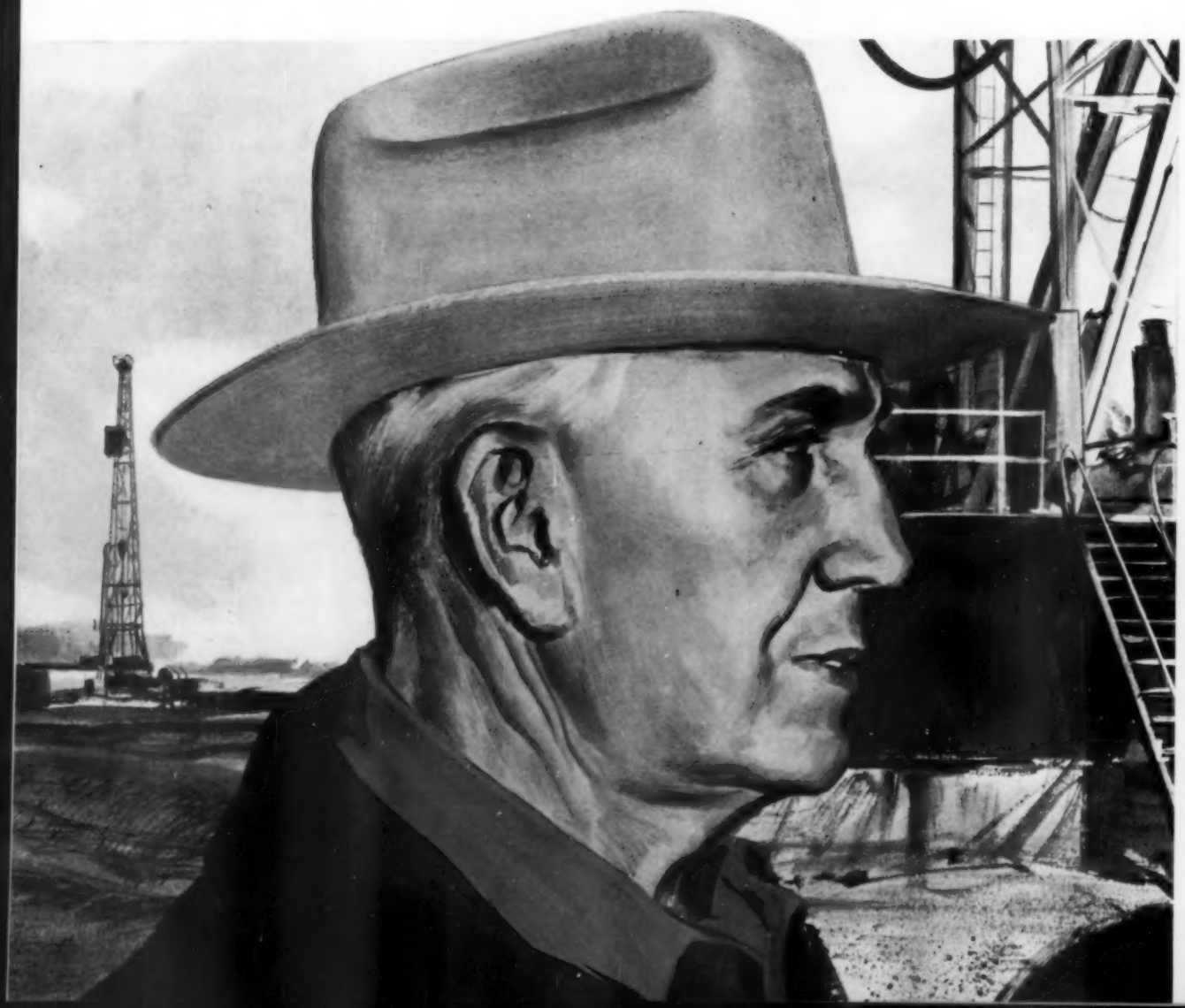

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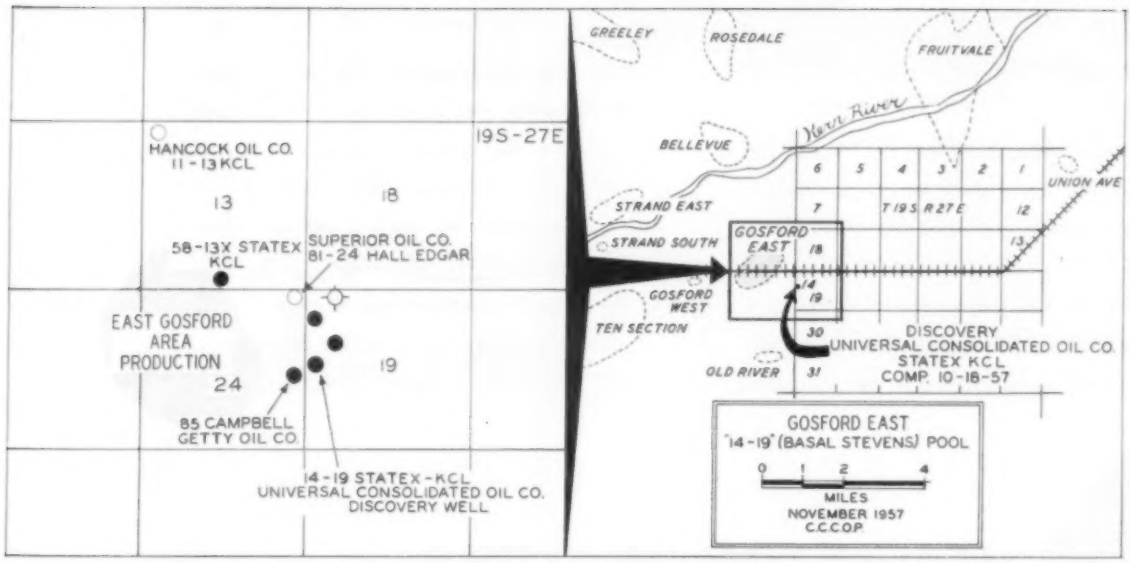


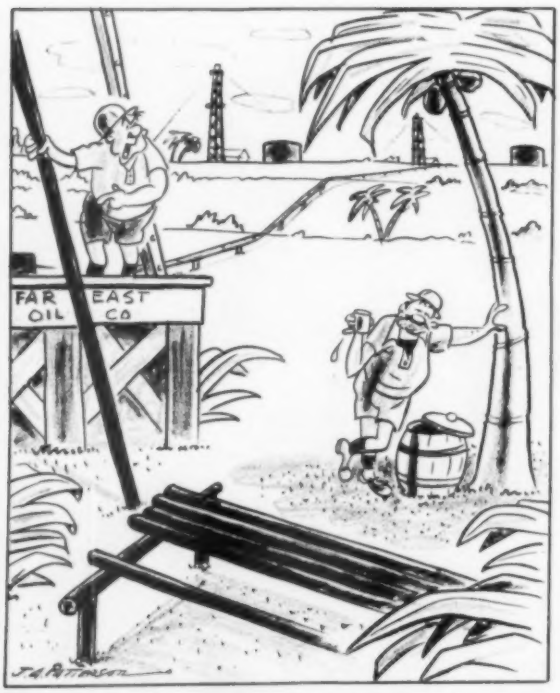
NEW ACTIVITY is being felt in the East Gosford section (left) of the Gosford field in Kern County, California, as wildcats are being drilled in an effort to extend the field's production.

Californians Step Out for Stevens pay probe

THE SEARCH for Stevens zone production in the East Gosford area of the Gosford field in Kern County, is being sparked by extension tests by Hancock Oil Co. and Universal Consolidated Oil Co.

Hancock was reaching out the farthest with a wildcat located about 1½ miles northwest of Universal's Basal Stevens discovery of last October. The Hancock test, 11-13 KCL, was at total depth of 10,405 ft. where the operator was reaming to 9,600 ft. prior to setting 5½-in. casing.

Universal's latest effort to extend its Miocene Stevens production be-



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yond the discovery and two extensions was a successful completion last week about 3,000 ft. northwest of the nearest other zone producer and 1 mile northwest of the discovery. The new well, 58-13X Statex-KCL, was completed in the Stevens at 9,365-89 ft., 9,388-93 ft., 9,412-18 ft. and 9,439-60 ft. flowing 541 bbl. daily of 33°-gravity crude through a 16/64-in. choke.

The only other operator with a well in the Universal discovery pool is Getty Oil Co. which completed 85 Campbell offsetting Universal's discovery. The Getty well was selectively perforated in several intervals between 9,628-9,756 ft. It flowed 528 bbl. daily 33.9° through a 24/64-in. choke upon completion last month.

Superior Oil Co. was getting ready for a completion try with a well about midway between Universal's latest completion, 58-13X Statex-KCL, and the Universal discovery well. Universal was also moving in equipment for an offset test to 58-13X Statex-KCL in 13-30s-26e.

The discovery was made last October in SW NW 19-30s-27e with a 9,982-ft. wildcat about ½ mile east of the nearest East Crawford area producer. Universal found the new basal Stevens pool at 9,611-9,774 ft. The accumulation is in a stratigraphic trap. Initial production in the discovery was 303 bbl. of 32°-crude.

The cut in the discovery well ran to 38%. However, the cut in the rest of the wells completed thus far have been considerably under that—averaging around 2%.

California Desert Wildcatting Slows

The state's desert wildcatting is at a virtual standstill. Kent Imperial Corp. temporarily suspened operations on 1 Sinclair near the Salton Sea in Imperial County after the test blew steam from four holes at 3,370 ft. Total depth is 4,720 ft. Kent was considering methods for utilitizing the steam, possibly for generating electricity.

The two desert wildcats in San Bernardino County, 1 Flamingo on the California-Arizona border was waiting on a bigger rig to deepen it beyond its present 2,203 ft., and the other, 1 Ricky in the Joshua Hills region of Mojave Desert, was standing idle at 210 ft.

The fourth desert wildcat, Cedric Brown 2 Well near Lancaster in the desert regions northeast of Los Angeles, was idle at 2,900 ft. Several major companies are reportedly signing up leases in this general area.

Weather acts up as . . .

snow conditions have hampered Michigan operations since early January. Spring breakup now starting has placed road restrictions on most of the state, holding up moving of rigs and servicing of wells. An example of snow-pestered operations is the one shown above, Ford Oil Co. 1 Gruncinski, SE NW NE 4-3n-12w, Hopkins Township, Allegan County, with an estimated 900 M.c.f. of gas in A-1 Salina dolomite. It is the first deep productive well in old 1,600-ft. Traverse oil field, and is 3 miles southeast of Salem-Dorr Salina oil and gas field.

New Find Indicated In North Dakota

THE western flank of North Dakota's famed Nesson anticline has a new indicated discovery. Amerada Petroleum Corp. 1 Ljaadal, C NE NW 29-150n-96w, flowed 13 bbl. of fluid, 80% oil from the Madison at 9,395-9,433 ft.

This possible new pool opener is located 6 miles southwest of Blue Buttes field and 3 miles south of Fancy Buttes field in McKenzie County.

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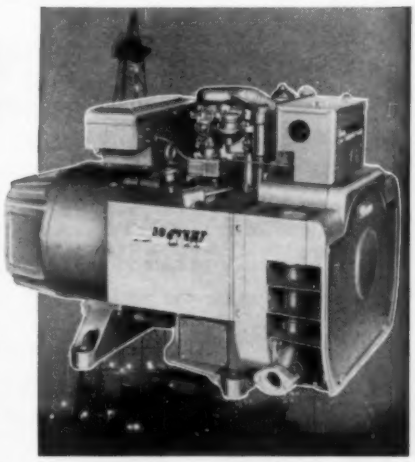

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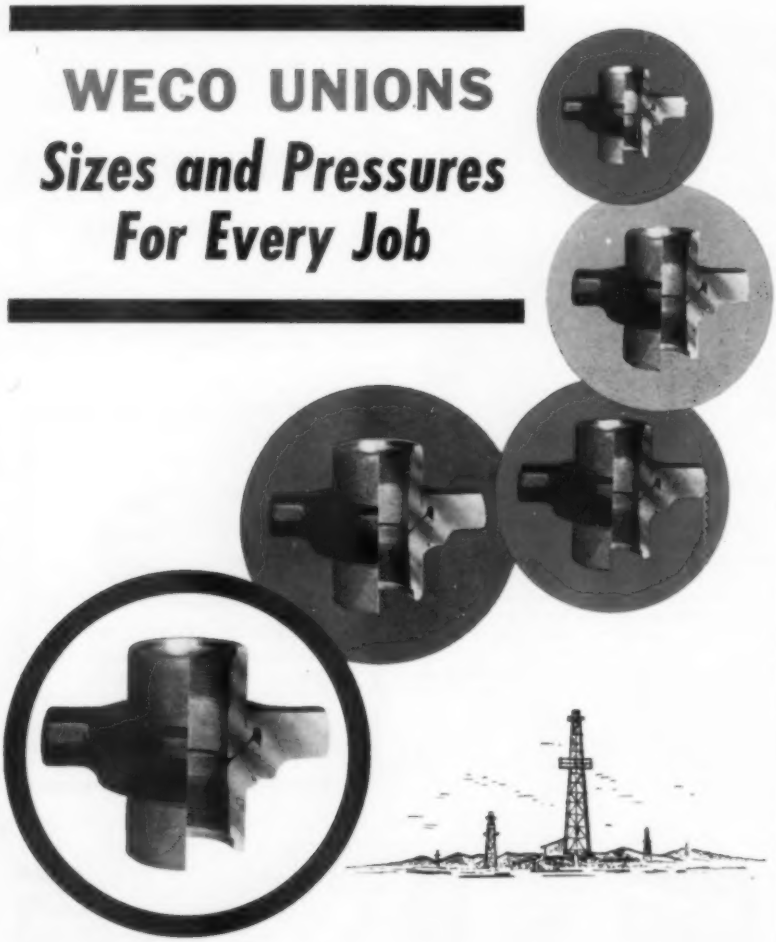

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Ohio gas pool discovery confirmed

CONFIRMATION of a gas pool in Pleasant Township, Perry County, 4 miles southeast of New Lexington, was reported by the operators, Witherspoon and McGee.

Their first test on 1 C. Hillis, Section 24, gaged 2,740 M.c.f. of gas with 50 bbl. oil in 24 hours after fracture from Clinton at 3,572-3,637 ft.

Their first offset, the 1 H. Storts, Section 24, gaged 3 M.M.c.f. daily after fracture from sand at 3,568-3,621 ft., and their third test in now under way.

Extension Announced To Ohio's Moreland

A mile-north extension to prolific Moreland pool in Franklin Township, Wayne County, has been announced by the operator, William Patton et al.

Their 1 Paul Finley, Section 34, drilled in with a 20-bbl. showing that increased after fracture to 200 bbl. in 24 hours along with 500 M.c.f. of gas.

Not to be overlookd in the same field is Franklin Oil Co. 1 Carrie Franks, Section 2, which logged the Newburg sand at 3,035-75 ft. and gaged 8,750 M.c.f. after acidizing.

Alberta exploration moves southward

THE EXPLORATORY trek in Alberta is beginning its seasonal shift southward. Three important discovery areas in the southwest part of the province lead interest in western Canada this month—Waterton Park, Willow Creek, and the Blood Indian Reserve.

Waterton Park . . . Shell Oil Co.'s 2 Waterton Park flowed 10,500 M.c.f. of gas per day on production tests of the Mississippian, extending this potentially mammouth gas field another 3 miles southeast.

The Waterton Park discovery area is at least 17 miles long and 3 miles wide. This fact, of course, assuming that the development by Shell in the southeastern sector ties in with the success of Texaco Exploration Co. to the northwest. That factor will be better known upon completion of another Shell well in the area that lies midway between the most northwesterly Shell completion, No. 1 Waterton Park, the discovery well of the area, and Texaco's A6-15 Gladstone Creek, the most southeasterly of the three indicated Texaco gas succcesses.

Willow Creek . . . It will be remembered that British American Oil Co. drilled 5-12-14-30 Willow Creek originally, finding some oil in the Lower Cretaceous. Bailey Selburn later took over the well for completion. If success is found, as tests to date seem to indicate, it will be the deepest producer in Canada. Production tests are now under way below 10,590 ft. A 73-ft. interval below that depth has been perforated, acidized, and fractured.

Blood Indian Reserve . . . Pan American Petroleum Corp.'s 14-23-6-24 Blood Indian Reserve followup success, LSD 14, 23-6-24w4, is the first close-in test to the firm's recent discovery well at 2-23 Blood. That well is currently on pump production tests. Meanwhile, the followup well recovered 475 ft. of oil and gas-cut mud and 125 ft. of 36°-gravity oil on drill-stem test of the Mississippian. This well is ¾ mile northwest of the discovery well.

East Kentucky has apparent failure

In Breathitt County and on the west side of the newly discovered Puncheon Camp pool, Preston Oil Co. has an apparent failure at their 1 Reney Whitley.

Corniferous lime, the pool pay, failed to show any commercial oil. Top of formation was logged at 1,693 ft. and based at 1,802 ft. The Big Six at 1,802 ft. was also barren.

Operators are drilling ahead at 2,025 ft.

Texas Gets New Oil-Pool Find

A new oil-pool discovery has been made in Haskell County, Texas, by Sunray Mid-Continent Oil Co., as operator, with American Petrofina Co. of Texas, and Rowan & Hope as partners.

The 1 M. V. Jepson, located 5 miles west of the town of Rochester, was completed in the Strawn zone with an initial production of 160 bbl. of oil a day through a 16/64-in. choke.

CORRECTION

THE acknowledgments for "Western Canada Led 1957 Exploration" and "Canadian Scoreboard for 1957" on pp. 232 and 235 in The Oil and Gas Journal's Annual Exploration Number, March 17, 1958, were reversed. "Western Canada Led 1957 Exploration" was authored by Homer G. Patrick; "Canadian Scoreboard for 1957" was authored by B. W. Blanpied.

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Brooks County: Associated Oil & Gas Co. 2-D Cage, Guadalupe Del Encinal Grant, Leonardo Vargas Subd., A-603 (9 miles southwest of Falfurrias). Absolute open-flow potential 4,000 M.c.f. daily, GLR 15.2 M.c.f. per barrel, 59.8°, shut-in TP 3,040 psi., perforations 7,761-72 ft. (basal Frio). TD 8,750 ft. (New gas-condensate pay in Cage Ranch field.)

Dimmit County: Sutton Producing Co. 2 Bray, Jane E. Calder Sur., A-39 (11 miles northwest of Carrizo Springs). IP 63 BOPD, 11/64-in., 28°, GOR 360 cu. ft. per barrel, TP 154 psi., perforations 2,201-07 ft. (Navarro-Olmos "3" sand). TD 2,520 ft. (New oil pay in Rocky Creek field.)

General Crude Oil Co. et al 1 Harder, Section 12, Block 1, I&GN Sur., A-161 (1 mile south of Brundage). IPP 40.06 BOPD, 49.2°, GOR 350 cu. ft. per barrel, perforations 4,032-35 ft. (Navarro). TD 4,346 ft. (New oil pay in Aceituna field.)

Duval County: Tennessee Gas Transmission Co. 1 Garcia, Section 410, M. G. Perez Sur., A-1553 (9 miles northwest of San Diego). Shut-in gas-condensate well, no gage, perforated 4,752-61 ft. (Pettus). TD 5,515 ft. (New gas reservoir in Massingill-Chiltipin area.)

S. H. Howell and George Taggart, Jr., 1 Vaello, Section 6, R. Fletcher Sur., A-215 (3 miles southeast of Benavides). IP 114 BOPD, 3/16, 44.2, GOR 1,420 cu. ft. per barrel, TP 260 psi., perforations 4,800-12 ft. (Hockley-Woodley sand). TD 4,977 ft. (New field discovery—1¼ miles northeast of Benavides field.)

Hidalgo County: Northern Pump Co. 1 Lockhart Unit, Lot 236, Block 159, West Tract Subd., Llano Grande Grant (3 miles north of Weslaco). Absolute open-flow potential 3,800 M.c.f. daily, GLR 41.7 M.c.f. per barrel, shut-in TP 4,080 psi., perforations 8,912 ft. (Frio). TD 10,016 ft. (New field—North Weslaco.)

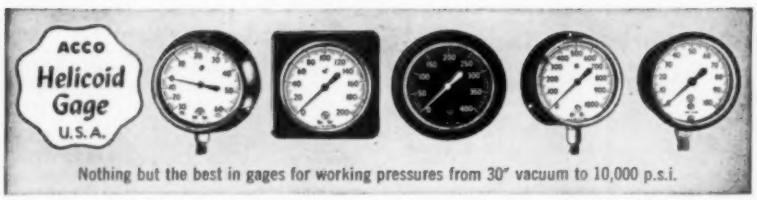
Bettis & Shepherd, Inc., 1 Eulogio de Rueda et al, Porcion 59 (7 miles southeast of Mission). Absolute open-flow potential 16,000 M.c.f. daily, GLR 79,250 cu. ft. per barrel, 60.7 , shut-in TP 2,469 psi., perforations 6,270-84 ft. (Frio). TD 7,820 ft. (New field discovery.)

Jim Wells County: J. A. Kimmey 6 Charles Muil, Los Presenos de Abajo Grant, A-171 (6 miles northeast of Alice). IP 99.36 BOPD (net), 10% water, 9/64-in., 25.5°, GOR 350 cu. ft. per barrel, TP 140 psi., perforations 4,008-18 ft. (Frio). TD 5,610 ft. (New oil pay in Captain Lucey field.)

Mrs. James R. Dougherty 1 Embleton, Los Presenos de Arriba Grant, A-148 (4 miles northeast of Alice). Absolute open-flow potential 12,300 M.c.f. daily, GLR 130,400 M.c.f. per barrel, 61.9°, shut-in TP 1,987 psi., perforations 5,059-65 ft. (Frio). TD 5,450 ft. (New field discovery—North Mary.)

Rand Morgan 2-K Fee, Section 9, Ragland Farm Ttracts. IP 123 BOPD, 7/64-in., 41.2°, GOR 307 cu. ft. per barrel, TP 675 psi., perforations 5,304-07 ft. (Vicksburg-Upper McNeil sand). TD 5,742 ft. (New fault segment and pay in Rand Morgan field.)

Starr County: Wood Brothers & Langham 2-C Wood, Porcion 84 (4½ miles east of Rio Grande City). IPP 27.5 BOPD, 22°, perforations 1,387-91 ft. (Frio).



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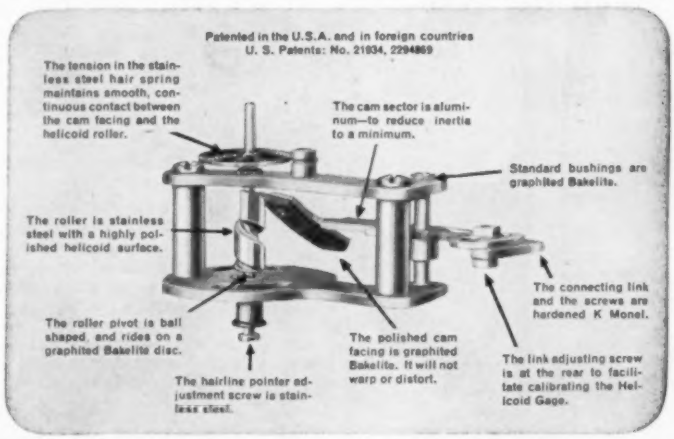
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Wood Brothers & Langham 3-C D. G. Wood, Sr., Porcion 84. IPP 34.37 BOPD, 22°, perforations 1,563-66 ft. (Frio). TD 1,690 ft. (New pay in Gregg Wood field.)

V. F. Neuhaus 1-A Cameron et al Unit, Section 487. Absolute open-flow potential 18,000 M.c.f. daily, GLR 69.2 M.c.f. daily, 64.2°, shut-in TP 2,473 psi., perforations 6,452-73 ft. (Vicksburgh). TD 7,503 ft. (New gas-condensate pay in Yzaguirre field.)

Wilson County: Exeter Oil Co., Ltd., 1 Bruno Bienek, M. J. Hernandez Sur., A-129 (3 miles north of Poth). IP 120.3 BOPD, 5/32-in., 33.5°, GOR 350 cu. ft. per barrel, TP 500 psi., perforations 6,157-62 ft. (Austin chalk). TD 6,423 ft. (Second well and new pay discovery in North Poth field.)

TEXAS GULF COAST

Calhoun County: Superior Oil Co. 2 Maude B. Traylor, Phillips Dimmitt Sur., A-11. IP 99 BOPD, 6.5/64-in., 42.3°, GOR 615 cu. ft. per barrel, TP 1,145 psi., perforations 7,636-39 ft. (Frio). TD 10,900 ft. (New pay in North Maude B. Traylor field—Point Comfort area.)

Liberty County: Kilroy Co. of Texas and Harry Hurt 1 Zadie Nolte, T&NO Sur. 31, A-375 (7 miles southwest of Nome). Absolute open-flow potential 7,750 M.c.f. daily, GLR 500 M.c.f. per barrel, 43.7°, shut-in TP 3,669 psi., perforations 8,588-94 ft. and 8,603-07 ft. (Frio). TD 9,017 ft. (New field—northwest flank of abandoned East Cottonwood field.)

Wharton County: Coloma Oil & Gas Corp., 1 Gresham, Lot 7, Block 2, John Bridges Sur. (6 miles north of Louise). IP 101 BOPD, ⅛-in., 43°, GOR 1 M.c.f. per barrel, TP 460 psi., perforated 4,968-70 ft. (Frio). TD 5,512 ft. (New oil reservoir in Blanco area.)

SOUTH LOUISIANA

Acadia Parish: American Louisiana Pipeline Co. 1-A Desormeaux, 24-10s-2w. IP 12 BOPD and 803 M.c.f. daily, 3/16-in., 58°, TP 1,100 psi., perforations 9,589-9,602 ft. and 9,619-31 ft. TD 10,250 ft. (Old hole deepened from previously abandoned depth of 10,250 ft.—New field discovery.)

Midwest Oil Corp. 1 Lawson, 7-9s-1e. Open-flow potential 17,500 M.c.f. daily, 29 BC per M.M.c.f., 44.1°, shut-in TP 5,935 psi., perforations 11,596-11,-609 ft. (first Bolvina Mexican sand). TD 12,794 ft. (New field—East Ellis.)

Beauregard Parish: Russell Maguire 1 Crawford et al, 17-4s-12w. IP 182.16 BOPD, 11/64-in., 38.4°, GOR 1,591 cu. ft. per barrel, TP 925-75 psi., perforations 10,684-92 ft. TD 12,056 ft. (New oil reservoir and extension discovery—1 mile east of Bon Wier field of Newton County, Texas.)

Cameron Parish: Forest Oil Corp. 7 Miller, 29-15s-5w. IP 2,900 M.c.f. daily, 58 BOPD, 3/16-in., 49°, TP 4,100 psi., perforations 10,984-60 ft. TD 12,750 ft. (New pay in Crab Lake field—workover well previously completed at 12,545-60 ft.)

Austral Oil Exploration Co. 1 John Mecom et al, 1-15s-11w. IP 3,500 M.c.f. daily, 3/-in., GLR 65 M.c.f. per barrel, 57.8°, TP 3,150 psi., perforations 11,041-61 ft. TD 11,178 ft. (New pay in Holly Beach field.)

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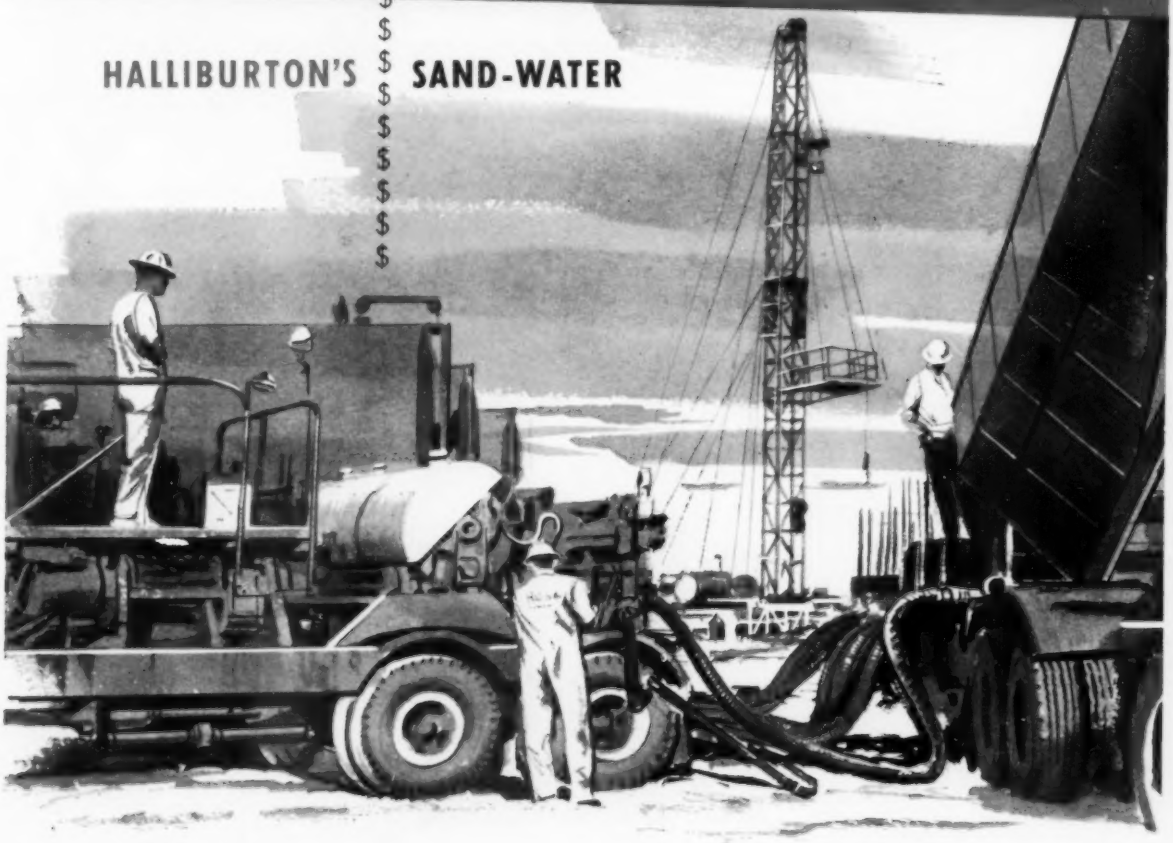

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Iberia Parish: Shoreline—American Louisiana Pipeline Co. 1-A Beaullieu, 35-12s-8e. IP 200 BOPD, 210 M.c.f. daily, ⅛-in., 36.7°, TP 1,750 psi., perforations 12,335-38 ft. TD 12,846 ft. (New pay in Loisel field—Redrilled dry hole.)

Jefferson Davis Parish: Pan American Petroleum Corp. 1-B Lacassine, 32-11s-4w. IP 110 BOPD, 3,000 M.c.f. daily, ⅛-in., 45.2°, TP 7,750 psi., perforations 15,044-54 ft. TD 15,510 ft. (New pay in South Thornhill field—East extension.)

Lafayette Parish: J. P. Owen et al 2 Willie Clement, 11-10s-2e. IP 77 BOPD, 1/10% b.s. & w., 2,418 M.c.f. daily, 5/32-in., 56°, TP 6,600 psi., perforations 11,308-13 ft. TD 14,410 ft. (Second well and new pay in Southeast Rayne field.

Lafourche Parish: California Co. 5 Alton Jones, 61-17s-21e. IP 80 BOPD (net), 25% b.s. and w., and 4,614 M.c.f. daily, ¼-in., 50.5°, TP 3,000 psi., perforations 9,408-62 ft., TD 11,313 ft. (New pay in Cut Off field.)

Howell & Howell 1-B Southdown, 24-14s-16e. IP 14 BOPD and 1,920 M.c.f. daily, ⅛-in., 25.5°, TP 7,100 psi., perforations 12,795-98 ft. TD 13,733 ft. (Extension and new-pay discovery in St. John field.)

California Co. 1 LL&E, 41-19s-22e. Shut-in gas well, no gage, perforated 11,-608-32 ft. TD 12,600 ft. (New pay in Bayou Raphael field.)

Union Oil Co. of California 1-LLL&E., 39-15s-19e. IP 133 BOPD and 3,850 M.c.f. daily, ¼-in., 50.6°, TP 3,475 psi., perforated 11,794-11,808 ft. TD 13,500 ft. (New-field discovery.)

Pointe Coupee Parish: Texas Crude Oil Co. 1 Bergeron, 119-6s-9e. IP 113 BOPD, ¼-in., 44.2°, GOR 2,000 cu. ft. per barrel, TP 1,625 psi., perforated 10,729-35 ft. TD 11,326 ft. (New field—2 miles southwest of Frisco field.)

Rapides Parish: Roger J. Bassett 1 Lee Lumber Co., 17-3n-2e (4½ miles northwest of Ruby). IP 54 BOPD, 5/32-in., 40°, GOR 370 cu. ft. per barrel, TP 220 to 310 psi., perforated 6,442-44 ft. TD 7,612 ft. (New field.)

St. Charles Parish: Anderson-Prichard Oil Co. et al 1 Waterford Oil Co., 4-13s-22e. IP 180 BOPD, ⅛-in., 40.6°, GOR 11.15 M.c.f. per barrel, TP 1,900 psi., perforated 10,044-46 ft. TD 10,211 ft. (Second well and new pay in West Avondale field.)

Vermilion Parish: Sunray Mid-Continent Oil Co., Skelly Oil Co., and Buffalo Oil Co. 1 State Lease 3020, Township 15s-3e, in Vermilion Bay (3 miles southwest of Intercoastal City). IP 15 BOPD and 1,950 M.c.f. daily, 5/32-in., 48.6°, TP 3,950 psi., perforated 13,-891-95 ft. TD 17,000 ft. (New field.)

LOUISIANA OFFSHORE

Eugene Island area: Sinclair Oil & Gas Co. 6-A OCS-0438, Block 175. IP 356 BOPD, ⅛-in., 32°, GOR 680 cu. ft. per barrel, TP 3,900 psi., perforations 11,833-46 ft. TD 12,088 ft. (New pay and extension in Eugene Island Block 175 field.)

Main Pass area: Gulf Oil Corp. 2 State "QQ" 195, Block 47. IP 369 BOPD, 3/16-in., 28.2°, GOR 144 cu. ft. per barrel, TP 1,100 psi., perforations 8,334-44 ft. TD 10,002 ft. (New pay and extension Main Pass Block 47 field.)

South Timbalier area: Sinclair Oil & Gas Co. 4-A OCS-0605, Block 86. IP 237 BOPD, 5/32-in., 35°, GOR 759 cu. ft. per barrel, TP 1350 psi., perforations 12,264-70 ft. TD 13,689 ft. (Extension and new pay in South Timbalier Block 86 field.)

Vermilion area: Zapata Offshore Co. and Felmont Oil Co. 1 OCS-9172 (State Lease 1446). IP 106 BOPD and 3,600 M.c.f. daily, 3/16-in., 50.4°, TP 4,640 psi., perforations 10,828-44 ft. TD 10,-910 ft. (New field.)

California Co. 1-B OCS-0492, Block 179. IP 162 BOPD, ¼-in., 42°, GOR 720 cu. ft. per barrel, TP 720 psi., perforations 6,108-46 ft. TD 7,583 ft. (New pay in Vermilion Block 164 field.)

West Delta area: Continental Oil Co. (CATC Group operator) 1 OCS-0182 (State Lease 1534), Block 70. IP 247 BOPD, 3/16-in., 35.5°, GOR 2,996 cu. ft. per barrel, TP 2,150 psi., perforations 9,240-54 ft., 190 BOPD, ⅛-in., 28.1°, GOR 684 cu. ft. per barrel, TP 950 psi., perforations 8,414-22 ft., and 253 BOPD, ⅛-in. 32°, GOR 350 cu. ft. per barrel, TP 1,200 psi., perforations 8,456-72 ft. TD 13,495 ft. (New field—triple completion.)

PENNSYLVANIA

Westmoreland County: Mount Pleasant Township. Peoples Natural Gas Co. 2-4145 I. Keck, elev. 1,887 ft. IP 585 M.c.f. of gas per day after fracture, rock pressure 2,490 psi., Oriskany sand 7,702 ft. TD 7,722 ft.

WEST VIRGINIA

Roane County, Geary district: United Fuel Gas Co. 2-81000 J. H. Clinton sand test. IP 336 M.c.f. of gas per day after fracture. Cilnton sand 7,069 ft. TD 7,149 ft. Elev. 666 ft.

STEEL

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Stainless—pipe, tubing, sheets, plates, bars, etc.

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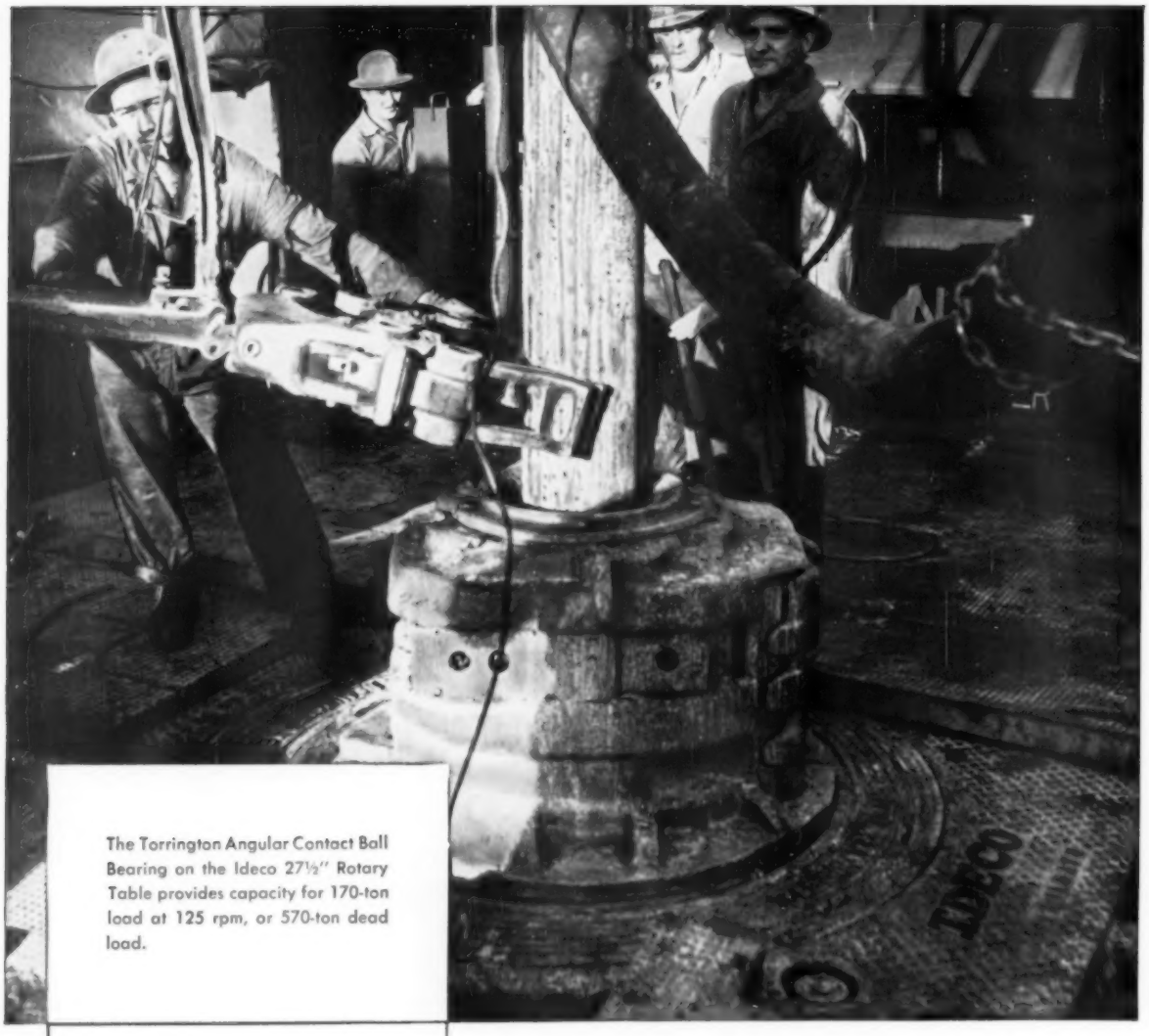

The Torrington Angular Contact Ball Bearing on the Ideco 27½" Rotary Table provides capacity for 170-ton load at 125 rpm, or 570-ton dead load.

Big strings driven on Torrington bearings!

The Ideco 27½" Streamlined Rotary, with its 570-ton dead load capacity and 170-ton operating capacity at 125 rpm, is equipped with a Torrington Angular Contact Ball Thrust Bearing to insure safe, speedy drilling.

These heavy-duty main bearings consist of thirty 3" hardened and ground steel balls mounted in precision-ground hardened steel races. A bronze retaining ring spaces the balls for even load distribution and smooth operation. Angular contact design enables the bearing to carry not only the high thrust load but also the radial load imposed by the driving gear.

In all types of oil field equipment, Torrington Bearings are turning in excellent performance records. Torrington offers every major type of anti-friction bearing, and the experience to help you put the *right* bearing in your application for dependable, profitable service. **The Torrington Company, South Bend 21, Ind.—and Torrington, Conn.**

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Veteran of Leduc Heads CPA

THIRTEEN is regarded as an unlucky number by most people. Vernon Taylor, manager of the western region, producing department, Imperial Oil, Ltd., is an exception.

On February 13, 1947, he was in charge of Imperial's producing operations in western Canada when Leduc No. 1 kicked in. It was the most important single development in Canadian oil history.

On February 13, 1958, Taylor was elected chairman of the board of governors of the Canadian Petroleum Association. The association represents 415 oil producing and exploration companies throughout Canada.

With the exception of a few years in Toronto, Taylor has spent his entire business life in western Canada. He was born and reared in Winnipeg. He attended the University of Manitoba where he studied geology and earned both a B.A. and B.S. degree.

In 1929 he went to work for the Canadian Government as a subsurface geologist in Alberta. When the province took over the mineral rights in 1930, he transferred to the geology staff of the Alberta government. His work was largely confined to geological and production engineering operations in the Turner Valley field.

Taylor left government for private business in 1937 when he went to work for Royalite Oil Co., then a subsidiary of Imperial, as a production engineer. He was later made production superintendent.

When Imperial decided to step up its exploration campaign in western Canada in 1945, it brought Taylor into the parent company. He was made operations manager of western production that year.

Vernon Taylor . . .
. . . Thirteen is lucky.

Imperial's campaign was an exhaustive and determined one. It drilled 133 dry holes before Leduc No. 1 came in and transformed the Canadian oil industry. Up to that time, Canada had only two major fields, Turner Valley, discovered in 1914, and remote Norman Wells, discovered in 1920.

The Leduc discovery began an era of development that has raised Canada from a minor oil producing nation to one of the world's most important.

Vern Taylor was on the site when Leduc No. 1 came in. It was a gratifying experience for him and the crew but neither could have envisioned the immense significance of the era it ushered in.

In 1948 Taylor was made operating manager for Imperial's producing department and was transferred to Toronto. He was there until 1951 when he returned to Calgary as a management assistant. He became manager of western producing operations in May 1955.

Other interests . . . In addition to heading Imperial's western producing operations, Taylor has been a director of Alberta Gas Trunk Lines since its founding and is now its president. Alberta Gas Trunk Line gathers natural gas from Alberta fields for Trans-Canada Pipe Line.

He has been, as his present post indicates, active in the affairs of the Canadian Petroleum Association. He is also a member of the Calgary Petroleum Club, the Glencoe Club, and the Calgary Golf and Country Club.

His wife, the former Irene Burrows of Calgary, comes from what is now oil and gas country. Her home was in Spirit River in the Peace River district. They have three daughters, the eldest of whom is following in her father's footsteps. She, too, attended the University of Manitoba and is now employed in the oil industry in Calgary.

Taylor was once a familiar figure in the Edmonton area oil fields but has since doffed his ski cap and parka for a business suit. The fact that the producers and exploration men picked him for their No. 1 post is evidence that the transition has not cost him their esteem.

Taylor has his own, simple, year-round scheme for exercise. He golfs in summer and curls in winter. He is also a pretty fair hand at the piano.

Personals

Bob Glaze, Pure Oil Co. geologist, has been transferred to Casper, Wyo., from Midland, Tex.

Paul L. Work has been promoted from spectroscopist to acting group leader at Tidewater Oil Co.'s Delaware refinery.

Fred S. Jones, superintendent of communications and electrical engineering for Platte Pipe Line Co., has been promoted to superintendent of engineering and communications. A graduate of the University of Kansas, Jones joined Platte in 1952.

Robert W. Grunert, senior vice president of South Penn Oil Co., has been transferred to company general offices in Oil City, Pa., from Bradford, Pa. He will continue as vice president in charge of production and will also direct the Joseph Seep Purchasing Agency.

Paul Balbin, formerly geophysicist for Pan American Petroleum Corp., has been appointed chief geophysicist for Chaco Petroleum, S.A., Bolivian subsidiary of Tennessee Gas Transmission Co. Balbin will headquarter in Cochabamba, Bolivia. Chaco Petroleum is operator for a group of U. S. companies with exploration rights in an area near the Bolivian-Argentine border.

Lindsey Hatchett, vice president of Arkansas Louisiana Gas Co., has been named supervisor of all Arkansas operations for the company.

Five citations for service will be awarded at the American Petroleum Institute Division of Production Mid-Continent district meeting this week in Oklahoma City. Receiving the awards will be **Jack Abernathy,** Big Chief Drilling Co., Oklahoma City; **L. F. Davis,** Atlantic Refining Co., Tulsa; **M. L. Powers,** University of Oklahoma, Norman; **Jack Tarner,** Phillips Petroleum Co., Bartlesville, Okla.; and **J. Zaba,** Pan American Petroleum Corp., Tulsa. The citations recognize outstanding service to the API.

Personals

H. G. VESPER

H. G. Vesper has been elected president of Standard Oil Co. of California, Western Operations, Inc. Vesper was formerly vice president in charge of marketing for Standard of California and is a former president of California Research Corp. He succeeds **E. J. McClanahan,** who has been named director of marketing for Socal. McClanahan will continue as chairman of the board for Western Operations, Inc. He is a vice president and director of the parent company.

Herbert D. Miller, district petroleum engineer in Longview, Tex., for Amerada Petroleum Corp., has been transferred to Tulsa as production engineer.

P. R. Hunter has been named supervisor of operations in the crude-supply section of British American Oil Co.'s crude and products-supply department, Calgary. **S. T. Richardson** has been appointed supervisor of services.

Wayne E. Glenn, Continental Oil Co., has been elected president of the Denver Petroleum Club. Other officers are **R. W. Sullivan,** Denver attorney, first vice president; **R. L. Sielaff,** Tennessee Gas Transmission Co., second vice president, and **Otis Cargile,** Shell Oil Co., secretary. New directors of the club include **Collis P. Chandler,** Chandler - Simpson Oil Co.; **William D. Hewit,** Hewit-Gulick Drilling Co.; **C. W. Horstmeier,** Sinclair Oil & Gas Co.; **R. L. Manning,** R. L. Manning Co.; and **William W. Walmsley,** Sun Oil Co.

George J. Hanks, chairman of the executive committee and former president and board chairman of South Penn Oil Co., retired April 1. Hanks was vice president and a director of Tidewater Oil Co. before joining South Penn in 1944 as executive vice president. He became president later that year and moved up to chairman and chief executive officer in 1952. Hanks held this position until the 1955 merger of South Penn and the Pennzoil Co. He became president again at that time. **John E. Selden** succeeded Hanks as president last June. Hanks will continue as a director and consultant with the company.

Addison L. Hayner has left Reiter-Foster Oil Corp., where he was chief geologist and secretary, to become a consultant in New York.

Kenneth Holmes, geologist, has transferred to Bismarck, N. D., from Mobil Producing Co.'s Worland, Wyo., office.

N. A. Rousselot, vice president and general manager of Seaboard Oil Co.'s western division, Los Angeles, retired April 1.

Sam Rogers, exploitation engineer with Sohio Petroleum Co., has been transferred to Lafayette, La., from Oklahoma City.

L. G. Stock, exploitation engineer, has been transferred to Woodward, Okla., from Ardmore, Okla., by Shell Oil Co.

Ross Walker, assistant Beaumont, Tex., division manager for United Gas Corp., has moved up to division manager. He succeeds **W. F. Ivers,** who has retired. Walker was district manager in Gulfport, Miss., before transferring to Beaumont in January.

Cloy Fogleman, dispatching supervisor for Platte Pipe Line Co., has been promoted to assistant supervisor of oil movements and dispatching. **Fred Petty,** shift dispatcher, succeeds Fogleman as dispatching supervisor. **Larry Thompson,** formerly relief dispatcher, replaces Petty.

Edward A. Taylor has been named manager of Pennsylvania Industrial Chemical Corp.'s new West Elizabeth, Pa., plant. The plant will produce hydrocarbon resins and aromatic solvents. Taylor has been with Pennsylvania Industrial since 1946.

O. E. Mechem, formerly vice president and Rocky Mountain division manager for Delta Drilling Co., has joined Drilling Analysis Service Co. as general manager. He will headquarter in Denver. **R. W. Eckels** will succeed Mechem as division manager for Delta Drilling.

R. C. Frederick has been appointed coordinator for gas and gas liquids by Gulf Oil Corp. Frederick joined Gulf in 1927. He was production department coordinator of gas and gas liquids in 1955 when he left the company to join Pacific Northwest Pipe Line Corp. as vice president in charge of gas purchases and sales. Frederick rejoined Gulf in 1956.

R. H. GREEN

Russell H. Green, executive vice president of Signal Oil & Gas Co., has been elected president. He succeeds **Samuel B. Mosher,** founder of the company, who has been named chairman of the board, a new position. Mosher will be chief executive officer. Mosher has been president of the company since 1922. Green joined Signal in 1925. He was vice president in charge of operations before being named executive vice president 3 years ago.

Dr. Robert E. Schilson and **Dr. Robert W. Parsons** have joined the staff of Ohio Oil Co.'s Littleton, Colo., research center.

George F. Anderson, geophysicist with Carter Oil Co. in Oklahoma City, has joined Tennessee Gas Transmission Co. as division geophysicist in Denver.

G. G. Carnahan, junior exploitation engineer for Shell Oil Co. in Midland, Tex., has been promoted to exploitation engineer. **M. E. Kiel,** junior exploitation engineer in Midland, has been transferred to Houston. **J. M. Stowe,** New Orleans area junior exploitation engineer, transfers to Midland.

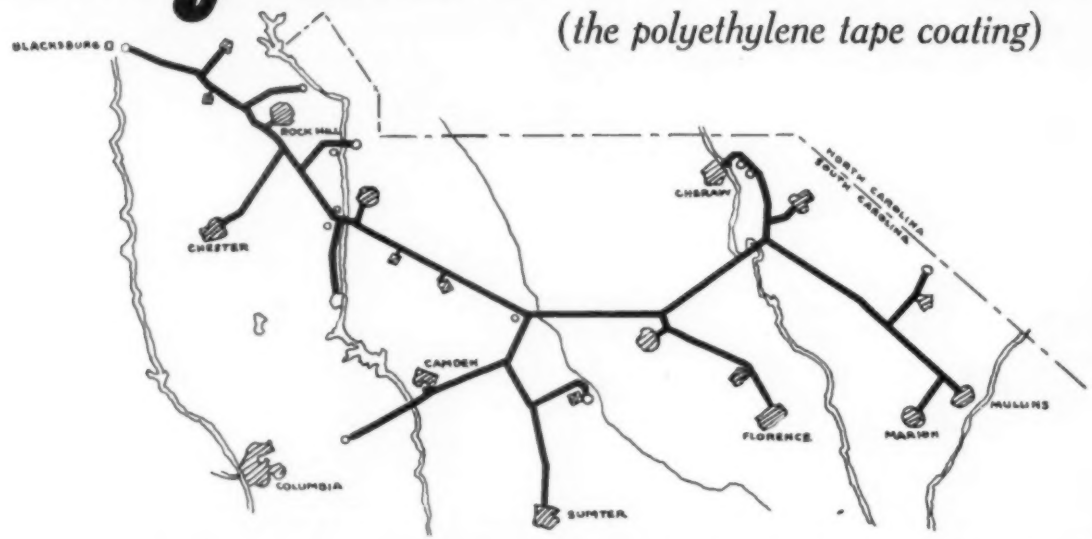
John W. Nichols, Oklahoma City oil man, has been named president of Mid-America Minerals Corp., new company formed by merger of Hilseweck Minerals Corp. and General Hydrocarbon Corp. **L. R. Wilson** is vice president in charge of the geological division for the new company. **W. N. Little** has been elected vice president in charge of production, and **Joe F. Gibson** is vice president in charge of the land department.

Dr. S. Norman Domenico, division geophysical technical supervisor for Pan American Petroleum Corp., has been transferred to Calgary from Tulsa. **Dr. M. B. Widess,** also division geophysical technical supervisor in Tulsa, has been transferred to Fort Worth. **Dr. Burl Tuller,** Midland, Tex., division geophysical technical supervisor, has moved to Casper, Wyo. Also transferred from Tulsa are **Donald Skow,** intermediate geophysicist, to Lubbock, Tex.; **William Grant,** geophysicist senior grade, to Casper; and **K. E. Smith,** geophysicist, to New Orleans. The moves are the result of decentralization of Pan Am's exploration and production activities.

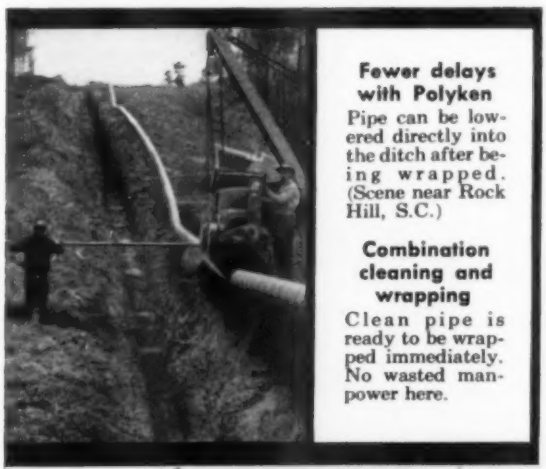
New Carolina pipeline chooses

Polyken Protection

(the polyethylene tape coating)

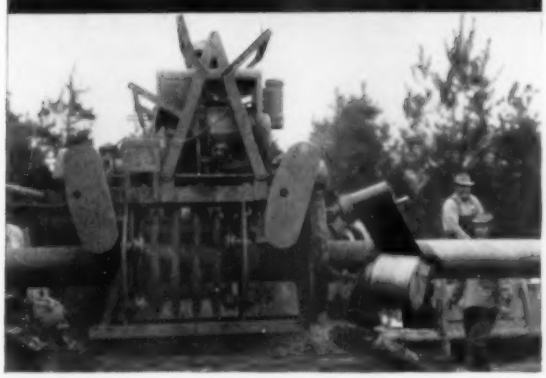


Carolina Pipeline Company, Inc., selects Polyken tape for its proven dependability . . . plus construction savings in time, labor and handling costs



Fewer delays with Polyken
Pipe can be lowered directly into the ditch after being wrapped. (Scene near Rock Hill, S.C.)

Combination cleaning and wrapping
Clean pipe is ready to be wrapped immediately. No wasted manpower here.



The Carolina pipeline system—serving ¼ of the entire state of South Carolina—will bring natural gas to one of the most important industrial regions of the South.

Polyken polyethylene tape was chosen as the coating for this system because it's proven.

Pipeline operators have seen how polyethylene stands up to the corrosive combination of moisture, soil chemicals and electrolytic current.

And contractors have found that The Polyken Method provides cost-cutting advantages like these:

1. **Substantial labor and equipment savings because of simplified operation.**
2. **Faster construction—consistent high daily output.**
3. **No hot dope preparation—tape is always ready.**
4. **No drying or cooling time. Simple clean-wrap-and-lower operation makes for a tight spread and closer supervision.**
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6. **Liabilities virtually eliminated—no fumes, no burns, no need to worry about human and livestock hazards.**
7. **Wrap goes into ground in factory-uniform condition.**

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THE KENDALL COMPANY
Polyken Sales Division

Personals

H. H. BIBLE

H. Harold Bible, vice president and assistant general manager of Monsanto Chemical Co.'s Lion Oil Division, has been named general manager of Lion Oil and a vice president of Monsanto. He has been with Lion since 1942. Bible succeeds **T. M. Martin,** who was president of Lion Oil when it was merged with Monsanto in 1955. Martin has been named to Monsanto's executive committee. He is vice president and a director of Monsanto.

Bill Patterson, district superintendent in Casper, Wyo., for Champlin Oil & Refining Co., has been transferred to Calgary. **Bill Moreland,** geologist, has transferred to Calgary from Abilene, Tex.

William H. Parker has been elected president of Titan-Tex Drilling & Production Corp. He succeeds **Washington C. Sentell,** who will continue as chairman of the board.

William J. Sherry, Tulsa independent operator, has been named chairman of the "Old Timers" committee for the 1959 International Petroleum Exposition. Sherry was chairman of the committee in 1953. The IPE will be held in Tulsa May 14-23, 1959.

S. Oliver Everley, manager of crude-oil acquisition and exchange for Wilshire Oil Co. of California, has been promoted to manager of operations. He will be responsible for the company's assets outside of its Norwalk, Calif., refinery. He will continue to direct crude-oil purchase and exchange.

Marvin L. McCullough, Rivercrest Oil Co., Inc., Wichita Falls, Tex., has been elected 1958-59 president of North Texas Oil and Gas Association. **R. J. (Dick) Moran,** Moran Brothers, Inc., has been reelected first vice president, and **David A. Kimball,** Alan Drilling Co., will be second vice president. **George W. Anderson, Jr.,** has been reelected executive vice president. McCullough, the new president, has been in the oil business since 1921 and a North Texas oil producer since 1937. He succeeds **Ralph O. Harvey, Jr.,** also of Wichita Falls, as association president.

Dr. Raymond Wynkoop, formerly assistant to the president of Houdry Process Corp., has joined Sun Oil Co.'s research and development division as assistant director, petrochemicals.

Joseph E. Gibbons has retired from Sun Oil Co.'s research and development department, Marcus Hook, Pa.

Hugh C. Ellis has been appointed manager of General Petroleum Corp.'s marine department. He succeeds **Lloyd J. Moore,** who has retired.

J. A. Andruske, Phillips Petroleum Co.'s district reservoir engineer in Alvin, Tex., has been transferred to Bartlesville, Okla., as reservoir engineer.

G. L. Wherry has been promoted to chief engineer by Shamrock Oil & Gas Corp. He will headquarter in Amarillo, Tex. Wherry was formerly chief technical advisor in Dumas, Tex.

Herbert H. Vickers, Oliver G. Lewis, and **William G. Dukek, Jr.,** have been named research associates by Esso Research & Engineering Co. **Moss F. Sheely** and **Earl M. Hawkins** have been appointed engineering associates.

James W. McEver, drilling foreman in Shell Oil Co.'s Denver division, has been transferred to Billings, Mont. **Arthur G. Speight,** geophysicist, has been promoted to district geologist in the Casper, Wyo., division. **Michael R. Straub,** junior mechanical engineer, has been promoted to mechanical engineer, Denver.

D. C. Walsh has been named senior coordination technician, coordination division, at Humble Oil & Refining Co.'s Baytown, Tex., refinery. **D. E. Bown** has been named senior research chemist, research and development division, there. In the engineering division, Humble has named **C. Bultzo** senior mechanical engineer, and **C. H. Carney** and **R. L. Martin** senior design engineers.

Paul R. Waddle, H. N. Kinney Brookings, and **Robert J. Moffatt,** formerly independent consultants, have formed Brookings, Moffatt & Waddle, oil and gas consulting firm in Shreveport. The company will provide consulting services in geology, engineering, and oil and gas law. Waddle and Moffatt were with Carter Oil Co. before opening consulting offices. Brookings was formerly with Phillips Petroleum Co.

Franklin T. Bethel, reservoir engineer, has been transferred to Denver from Billings, Mont., by Shell Oil Co.

Robert I. Renouf, engineering trainee with Continental Oil Co., has been promoted to associate engineer in Kilgore, Tex.

Bruce Robinson, Jr., has left Bishop Oil Co. in Denver to join Kern County Land Co. as geologist in Bakersfield, Calif.

William M. Harp has been named technical associate in the technical service division at Humble Oil & Refining Co.'s Baytown, Tex., refinery.

Dr. William Wyman Mallory, formerly supervisor of stratigraphic projects in the Rocky Mountain area for Phillips Petroleum Co., has joined Ball Associates, Denver and Washington consulting firm, in Denver.

John R. Humble, Jr., formerly chemical engineer with Gulf Oil Corp. in Port Arthur, Tex., has joined Howe-Baker Engineers, Inc., in Houston as process engineer.

Gene A. Northington, superintendent of the technical department at International Petroleum Co.'s Cartagena Bay, Colombia, refinery, has been appointed assistant manufacturing coordinator for the company. He will headquarter in Coral Gables, Fla.

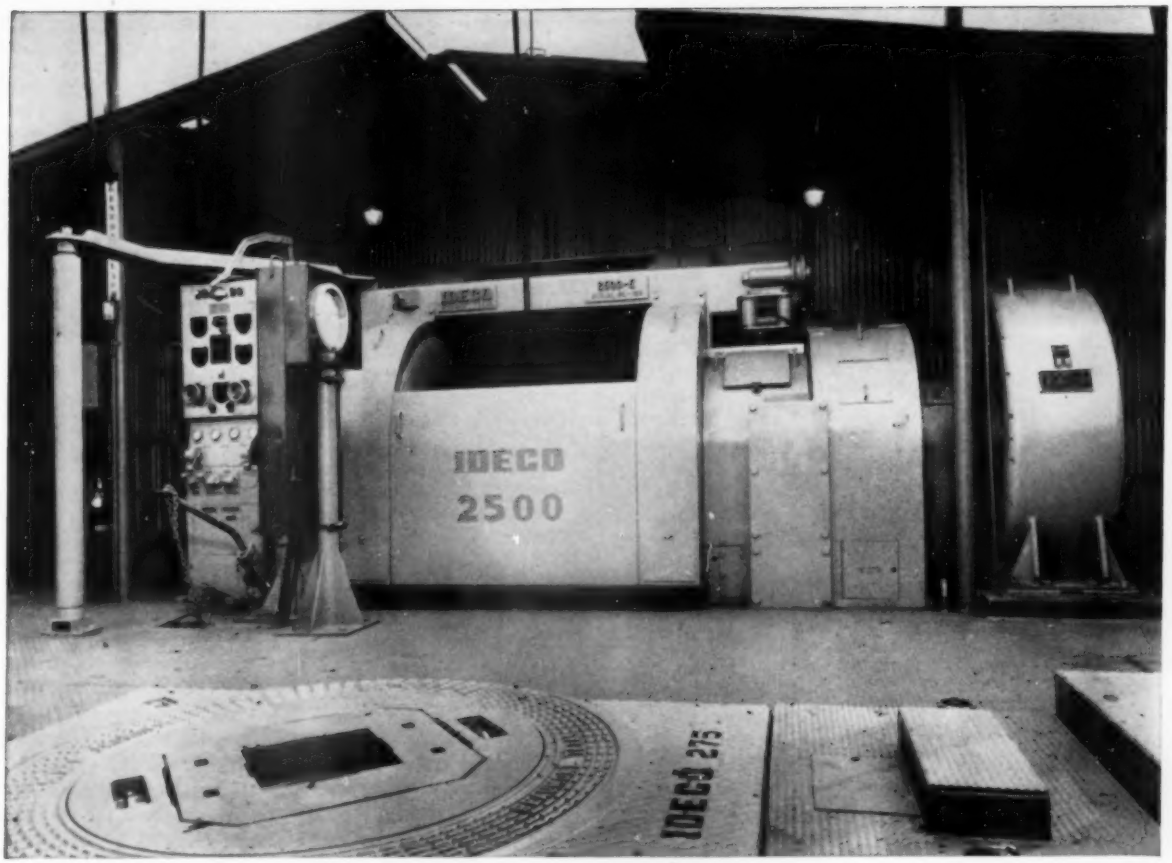
DEATHS

Marvin Cecil Fillinger, 32, New Cuyama, Calif., production foreman for Richfield Oil Corp., died March 27.

Arthur F. Bridge, 67, former president of Southern Counties Gas Co., died March 25 in a hospital near San Francisco. Bridge retired in 1954 because of poor health. He joined Southern Counties as rate engineer. He became vice president in charge of operations in 1928, and later was a director and general manager of the company before being elected president in 1947.

Fred H. Sperber, consulting engineer, died March 24 at Daly City, Calif. He was 48.

Lafayette M. Hughes, 78, Denver oil man, died March 27 in a Denver hospital.



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Second, CHAIN Belt offers the built-in *plus values* that make Rex Oil Field Chains so superior in their ability to resist fatigue and wear...to cut down time to the minimum. For instance, the unique "glide-fit" design of Rex Roller Chains assures easy, fast coupling and uncoupling of the chain with *no sacrifice in chain life.* In Rex Offset Side Bar Roller Chain, the famous 3-diameter pin gives you these same basic advantages.

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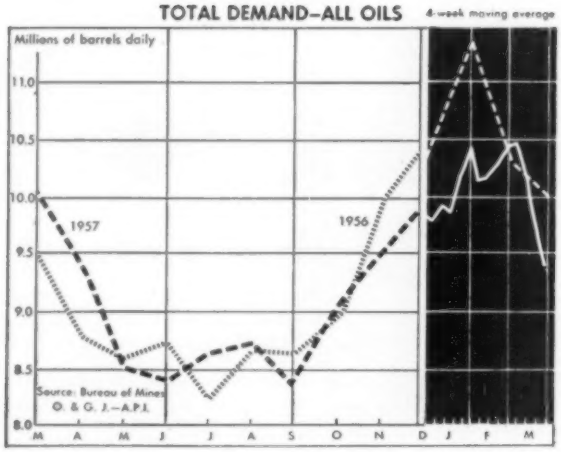
Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,295,775	UP	10,500	DOWN	1,439,466
Crude stocks	284,208,000	UP	922,000	UP	30,966,000
Completions	718	DOWN	137	DOWN	179
Rerinery runs	7,038,000	DOWN	278,000	DOWN	1,061,000
Gasoline stocks	216,647,000	DOWN	260,000	UP	13,158,000
Kerosine stocks	17,222,000	UP	44,000	DOWN	2,946,000
Distillate stocks	75,125,000	DOWN	3,324,000	DOWN	730,000
Recidual stocks	55,165,000	UP	152,000	UP	18,067,000
Four-product stocks	364,159,000	DOWN	3,388,000	UP	27,549,000
Total imports	1,404,900	DOWN	163,000	UP	25,200



Distillate prices sag; gasoline may move up

NEW YORK HARBOR distillate prices are at the lowest point since 1950, for this time of the year. Esso Standard Oil Co. reduced its postings 0.3 cent a gallon, effective March 27, for the second cut during the month.

The new barge price for No. 2 fuel in New York Harbor is 8.85 cents a gallon or 2.8 cents lower than quotations after the crude-price increase in January last year.

Here are the price changes for barge deliveries of No. 2 fuel in New York Harbor since the end of 1956. The first announcement of a crude-price increase last year was on January 3, and the period of price adjustments lasted almost 2 weeks. By the middle of January 1957, the barge price for No. 2 fuel had increased a cent a gallon to 11.65 cents. The price has been going down since that time.

The first cut was on May 9 when half a cent was chopped off to bring the price down to 11.15 cents a gallon. Another reduction before the middle of June lowered postings to 10.85 cents. The first week of July brought a cut of 0.2 cent followed by a 0.4-cent reduction early in August. The resulting price of 10.25 cents held for the rest of 1957.

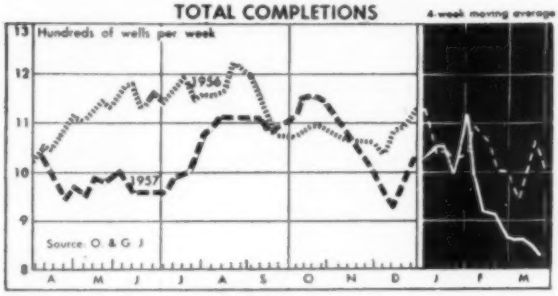
There was an attempt to raise distillate prices early in January of this year. Most suppliers did not follow the new postings, and prices actually dropped 0.2 cent before the end of the month. There were two downward adjustments in the first half of February, each for 0.2 cent a gallon. There were two more in March, one for 0.5 cent on March 12 and the latest for 0.3 cent on March 27.

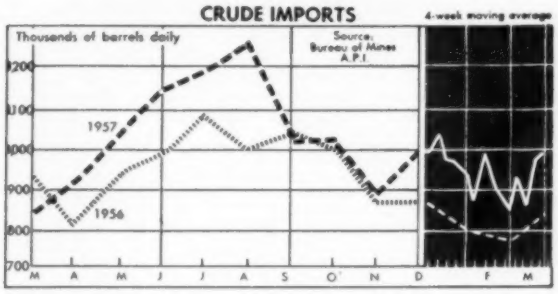
For the 15-month period, there were nine reductions in the No. 2 price in New York Harbor, some by changes in postings and others by adjustments in discounts off postings.

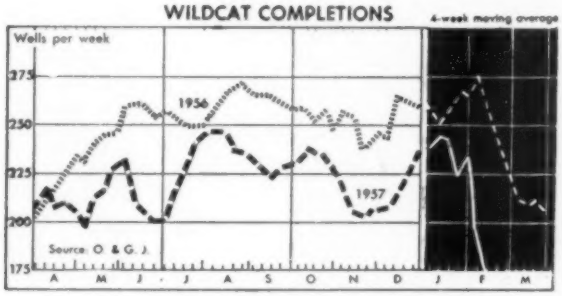
The latest reduction in New York is adding to the pressure on the Gulf Coast market. Formal postings remain at 8.125 cents a gallon, but material is freely available at discounts. Market rumors indicate that spot No. 2 is available at 0.375 cent off postings.

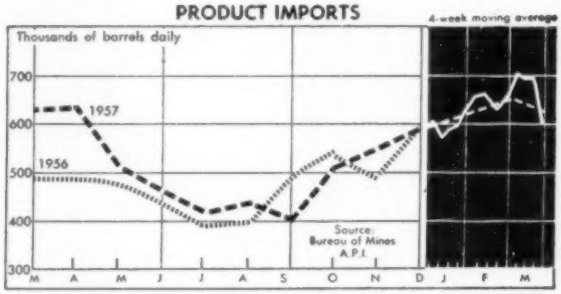
Some market analysts on the Gulf Coast believe that gasoline prices in the area will improve by the first of May. Reports from the area show sales of several cargoes of gasoline within the past 2 weeks, rumored to be going to the West Coast. Another half a million barrels in the Gulf Coast area probably could be bought at a substantial discount. Part of this may move in the first half of April.

Some of the important East Coast marketers with refineries on the Gulf Coast may find it more profitable to buy this distress gasoline than to increase runs at their own refineries. If refinery runs are reduced substantially, gasoline prices will move up.





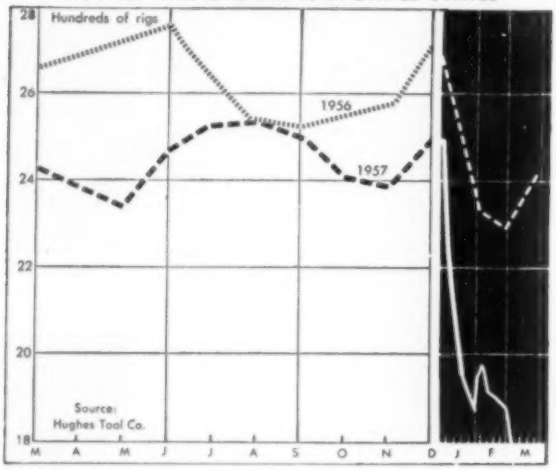




WEEKLY WELL COMPLETIONS . . . WEEK ENDED MARCH 29, 1958

	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1958	1957	Total	Crude	Cond.	Gas	Dry	1958	1957
Alabama	0	0	0	0	0	0	0	19	22	0	0	0	0	0	7	9
Arkansas	8	2	0	0	6	0	27,472	159	258	2	0	0	0	2	39	38
California	24	15	0	0	9	0	117,057	488	474	6	0	0	0	6	91	125
Colorado	16	3	0	4	9	0	83,207	184	256	6	0	0	1	5	97	173
Illinois	24	9	0	0	15	0	57,480	474	570	6	0	0	0	6	92	137
Indiana	7	2	0	3	2	0	5,648	168	150	1	0	0	0	1	56	28
Kansas	57	18	0	7	28	4	206,587	993	1,090	10	2	0	1	7	195	188
Kentucky	23	10	0	4	9	0	36,465	213	354	1	0	0	0	1	27	77
Louisiana	42	10	4	4	24	0	340,870	790	953	8	0	0	0	8	99	164
North	17	3	0	4	10	0	74,718	283	355	3	0	0	0	3	39	41
South	21	5	3	0	13	0	227,457	403	430	5	0	0	0	5	54	101
Offshore	4	2	1	0	1	0	38,695	104	168	0	0	0	0	0	6	22
Michigan	9	5	0	1	3	0	27,450	81	97	3	0	0	1	2	31	44
Mississippi	12	7	1	1	3	0	98,954	102	78	4	0	1	1	2	53	36
Montana	7	3	0	0	4	0	52,231	98	74	2	0	0	0	2	45	27
Nebraska	12	2	0	0	10	0	68,325	175	193	5	0	0	0	5	85	108
New Mexico	23	15	1	1	6	0	127,739	524	485	2	0	1	0	1	77	78
West	8	4	0	1	3	0	30,075	253	187	0	0	0	0	0	37	31
East	15	11	1	0	3	0	97,664	271	298	2	0	1	0	1	40	47
New York	10	5	0	0	0	5	13,500	131	113	0	0	0	0	0	9	0
North Dakota	4	2	0	0	2	0	21,538	106	79	0	0	0	0	0	36	32
Ohio	13	6	0	7	0	0	27,995	225	266	0	0	0	0	0	3	3
Oklahoma	111	58	3	6	38	6	393,409	1,733	1,664	11	0	0	0	11	233	186
Pennsylvania	0	0	0	0	0	0	0	23	301	0	0	0	0	0	4	25
Texas	283	129	12	17	118	7	1,286,189	4,504	5,384	65	2	4	1	58	957	1,486
District 1	20	5	1	0	14	0	56,147	220	269	10	0	0	0	10	90	106
District 2	21	5	3	1	12	0	129,373	150	167	8	0	2	0	6	42	74
District 3	15	8	1	0	6	0	64,606	302	460	1	0	0	0	1	53	150
District 4	21	4	3	3	11	0	101,023	281	343	5	0	1	0	4	90	128
East	20	8	0	1	11	0	111,100	325	313	4	0	0	0	4	91	92
District 7-B	30	13	0	0	17	0	89,410	572	737	9	1	0	0	8	176	278
West	90	60	1	1	24	4	489,979	1,347	1,520	17	0	0	1	16	212	259
District 9	46	15	0	8	20	3	160,112	966	1,248	9	1	0	0	8	175	372
District 10	20	11	3	3	3	0	84,439	341	327	2	0	1	0	1	28	27
Utah	11	6	0	3	2	0	54,504	117	38	1	0	0	0	1	20	24
West Virginia	10	2	0	5	3	0	29,970	184	160	1	0	0	1	0	7	9
Wyoming	11	6	0	0	5	0	51,944	202	201	2	0	0	0	2	68	75
Miscellaneous (Fla.)	1	0	0	0	1	0	12,810	29	19	1	0	0	0	1	23	14
Total U. S.	**718**	315	21	63	297	22	3,141,344	11,722	13,279	**137**	4	6	6	121	2,354	3,086
Total prev. week	855	421	14	83	321	16	3,585,938	.....	.....	155	16	1	6	132	.....	.....
Cum. 1958	11,722	5,861	265	881	4,463	252	49,621,323	.....	.....	2,354	215	33	89	2,017	.....	.....
Western Canada	69	35	0	4	27	3	362,482	641	667	30	3	0	3	24	239	186

ROTARY RIGS OPERATING IN UNITED STATES

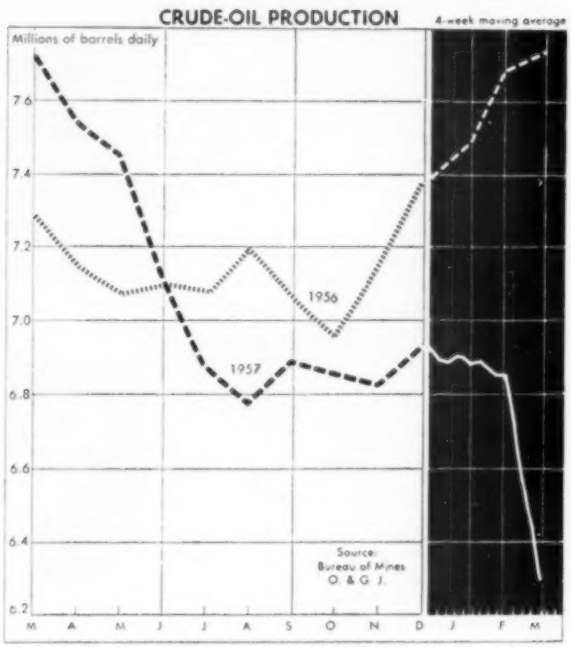


ACTIVE ROTARY RIGS*

	3-31-58	3-24-58	3-17-58	4-1-57
Alabama	4	6	5	12
Arkansas	18	16	20	20
Arizona	....	....	....	....
California	74	77	80	94
Colorado	24	32	27	39
Florida	1	2	1	2
Georgia	....	....	....	1
Idaho	....	....	....	....
Illinois	21	18	15	34
Indiana	3	3	1	6
Iowa	3	3	3	2
Kansas	79	68	71	130
Kentucky	1	1	1	3
Louisiana	303	316	327	413
North	27	26	29	51
South	224	230	237	265
Offshore	52	60	61	97
Maryland	....	....	....	1
Michigan	9	7	7	11
Missouri	....	....	....	....
Montana	20	18	21	27
Mississippi	34	32	34	20
Nebraska	19	13	12	30
Nevada	....	....	....	....
New Mexico	100	100	109	128
New York	1	1	1	1
North Dakota	39	38	33	26
Ohio	....	....	....	....
Oklahoma	179	147	132	203
Oregon	....	....	....	1
Pennsylvania	12	12	12	13
South Dakota	....	....	....	2
Texas	740	723	699	1,032
Gulf Coast	178	160	156	219
Offshore	4	2	3	8
West	285	291	293	417
North	236	233	207	335
East	37	37	40	53
Tennessee	....	....	....	....
Utah	37	37	38	26
Washington	2	2	2	....
West Virginia	2	3	4	1
Wyoming	38	38	39	49
Virginia	....	....	....	....
Total United States	1,763	1,713	1,694	2,327
Western Canada	158	180	208	181
Eastern Canada	2	2	1	....
Grand total	1,923	1,895	1,903	2,508

*Hughes Tool Co.

CRUDE-OIL PRODUCTION

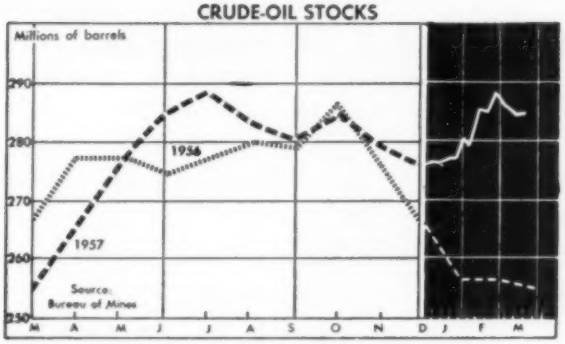


DAILY AVERAGE PRODUCTION FOR WEEK

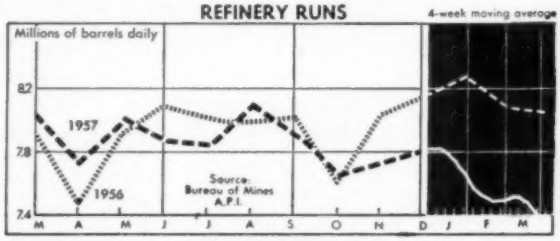
	March 29, 1958			Mar. 22
	Crude oil	Lease condensate	Total	total
Alabama	16,000	.....	16,000	15,925
Arkansas	83,150	200	83,350	83,200
California	880,500	.....	880,500	883,700
Colorado	141,025	.....	141,025	141,000
Eastern	48,600	.....	48,600	48,000
Florida	1,275	.....	1,275	1,275
Illinois	227,500	.....	227,500	229,400
Indiana	33,100	.....	33,100	32,100
Kansas	†298,700	.....	†298,700	†281,125
Kentucky	39,500	.....	39,500	39,600
Louisiana	726,200	89,000	815,200	819,075
North	108,450	2,500	110,950	114,825
South	617,750	86,500	704,250	704,250
Michigan	23,500	.....	23,500	24,200
Mississippi	99,400	4,975	104,375	104,375
Montana	75,050	.....	75,050	75,100
Nebraska	52,125	.....	52,125	52,800
Nevada	100	.....	100	150
New Mexico	255,225	6,600	261,825	265,100
North Dakota	30,150	.....	30,150	34,450
Oklahoma	†539,200	.....	539,200	†522,250
Texas	2,238,000	63,850	2,301,850	2,301,850
Dist. 1	44,000	500	44,500	44,500
Dist. 2	93,000	9,300	102,300	102,300
Dist. 3	327,000	32,000	359,000	359,000
Dist. 4	161,000	7,400	168,400	168,400
Dist. 5	28,000	400	28,400	28,400
Dist. 6	100,000	7,400	107,400	107,400
East Texas Field	125,000	.....	125,000	125,000
Dist. 7-B	132,000	150	132,150	132,150
Dist. 7-C	115,000	3,650	118,650	118,650
Dist. 8	816,000	1,500	817,500	817,500
Dist. 9	190,000	900	190,900	190,900
Dist. 10	107,000	650	107,650	107,650
Utah	17,650	.....	17,650	18,200
Wyoming	305,000	.....	305,000	312,150
Others	‡200	.....	‡200	‡200
Total U. S.	6,131,150	164,625	6,295,775	6,285,225
Change from previous week, up			10,500	
Canada	†449,000	.....	†449,000	†505,300
Total U. S. production—Jan. 1-March 29				588,413,190 bbl.
Same period last year (crude plus cond.)				*670,888,135 bbl.

*Includes 12,784,725 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

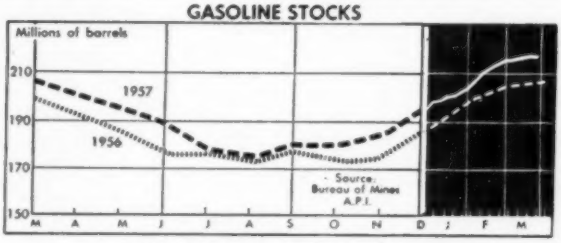
CRUDE-OIL STOCKS



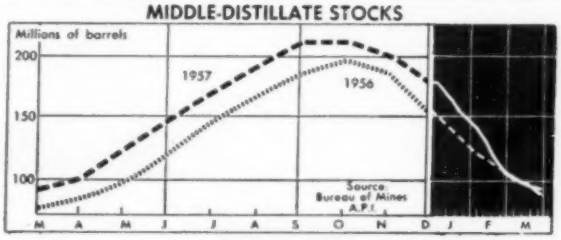
REFINERY RUNS



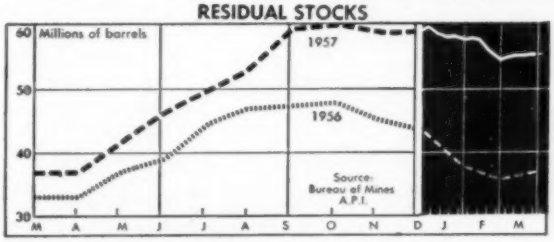
GASOLINE STOCKS



MIDDLE-DISTILLATE STOCKS



RESIDUAL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	3-22-58	3-15-58	3-23-57
Pennsylvania Grade	2,868	2,899	2,527
Other Appalachian	1,528	1,556	2,044
Illinois, Indiana, and Michigan	10,150	10,426	9,073
Nebraska and North Dakota	2,633	2,446	1,915
Kansas	9,465	9,462	9,015
Oklahoma	18,014	‡17,831	22,122
Arkansas	2,781	2,846	2,529
Louisiana	19,549	19,551	18,630
North	3,144	3,287	2,840
South	16,405	16,264	15,790
Mississippi, Alabama, and Florida	2,493	2,387	2,133
New Mexico	8,335	8,189	7,386
Texas	127,501	127,321	114,281
East Texas	7,986	8,555	10,778
West Texas	57,381	56,166	53,227
Texas Gulf	26,516	27,666	21,841
Other Texas	35,618	34,934	28,435
Wyoming	15,721	15,702	17,043
Other Rocky Mountain	7,772	7,085	6,182
California	38,858	38,703	26,686
Foreign	†16,540	16,882	11,676
Total	284,208	‡283,286	253,242

*Bureau of Mines. †Includes 4,412,000 bbl. in California. ‡Revised.

API REFINERY REPORT—MARCH 28, 1958

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, March 1957—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,155	519.0	33.4	303.6	195.8	47,423	6,784	23,224	10,567	1,229	504.4	44.7	323.2	219.3
Appalachian:														
District 1	99	42.4	5.3	23.6	8.7	5,108	537	1,621	592	104	40.1	4.6	24.6	9.6
District 2	94	39.4	6.3	21.0	9.7	2,886	316	649	482	109	54.2	7.6	19.0	14.6
Ind., Ill., Ky.	1,270	669.1	93.3	265.6	175.4	41,628	3,345	10,244	4,085	1,400	684.8	71.6	283.2	184.8
Minn., Wis., Dak.	93	34.9	1.6	24.7	19.9	6,949	447	3,308	559	103	48.6	6.5	24.7	7.9
Okla., Kans., Mo.	554	333.3	22.3	131.8	29.7	20,234	784	6,178	881	683	368.7	16.3	156.1	35.2
Inland Texas	239	174.6	12.0	40.7	24.0	8,651	304	1,152	2,064	270	207.0	8.8	53.7	21.6
Texas Gulf Coast	1,671	814.6	82.3	457.7	191.7	29,249	1,881	7,930	4,164	1,953	861.7	106.4	532.2	237.7
La. Gulf Coast	569	343.8	50.6	146.7	40.3	12,150	1,474	4,095	1,220	666	301.8	51.1	183.2	48.5
N. La. and Ark.	90	40.0	6.7	17.6	9.9	4,944	789	1,482	122	93	35.0	6.3	23.1	6.7
Rocky Mountain:														
New Mexico	23	11.3	1.0	5.0	2.6	439	21	138	87	26	14.0	0.5	4.8	3.3
Other Rocky Mt.	244	117.3	1.4	55.7	34.4	8,191	237	2,608	884	267	126.6	2.4	68.6	33.2
West Coast	937	492.7	1.8	129.6	255.6	28,795	303	12,496	29,458	1,144	496.2	5.7	164.2	382.5
Mar. 28, 1958	7,038	3,632.4	318.0	1,623.3	997.7	216,647	17,222	75,125	55,165	8,047	3,743.1	332.5	1,860.6	1,204.9
Mar. 21, 1958	7,316	3,571.0	336.0	1,655.3	1,028.1	216,907	17,178	78,449	55,013	.....	.....	.....	.....	.....
Mar. 29, 1957	8,099	3,715.3	310.0	1,756.6	1,254.0	203,489	20,168	75,855	37,098	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.00-11.50
Premium (98 octane)	13.75-14.25
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	9.75-10.25
Regular (92 octane)	10.00-10.50
Premium (97 octane)	11.50-12.00
Premium (98 octane)	11.75-12.50
California (rack) (Los Angeles):	
Regular (88 octane)	12.0
Premium (96 octane)	14.5
Premium (98 octane)	15.0
Caribbean area (cargoes):	
Regular (87 octane)	9.625-9.875
Premium (93 octane)	10.50-10.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.25-9.50
Diesel oil (58 d.i. and above)	8.875-9.125
Distillate No. 1	8.875-9.125
Distillate No. 2	8.25-8.50
Gulf Coast (cargoes):	
Kerosine 41-43	8.625-8.75
★ Distillate No. 2	8.00-8.25
New York Harbor (barges):	
★ Kerosine 41-43	9.35
★ Distillate No. 2	8.85
★ Diesel fuel, 48-52 d.i.	9.45
Caribbean area (cargoes):	
Distillate No. 2	8.125

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.25-1.30
Gulf Coast (cargoes):	
Bunker C fuel	$2.25-2.40
New York Harbor (barges):	
Bunker C fuel	$2.65
Caribbean (cargoes):	
Bunker C	$2.25
California (rack):	
Bunker C fuel, Los Angeles	$2.65-2.80

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	23.0
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.5
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	26
200 vis. neutral (180° at 100°), 25 p.t.	24

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour) ($)
14-14.9	$2.67	....	....	....	....
15-15.9	2.71	....	....	....	$1.81
16-16.9	2.74	....	....	....	1.86
17-17.9	2.78	....	....	....	1.91
18-18.9	2.82	....	....	....	1.96
19-19.9	2.85	....	....	....	2.01
20-20.9	2.89	$2.75	....	$2.62	2.06
21-21.9	2.93	2.77	....	2.64	2.11
22-22.9	2.97	2.79	....	2.66	2.16
23-23.9	3.01	2.81	$3.44	2.68	2.21
24-24.9	3.05	2.83	3.46	2.70	2.26
25-25.9	3.09	2.85	3.48	2.72	2.31
26-26.9	3.13	2.87	3.50	2.74	2.36
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low cold test Gulf Coast. ‡Sour. §Some heavy Wyoming sour posted at 8 cents less.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, Feb. 3, 1958.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.40
Middle District	4.22
Southwest Pennsylvania	3.93
West Virginia	3.75
Buckeye Grade	3.75
Illinois Basin	3.00
Canada:	
Leduc-Woodbend	2.74
Redwater (Alta.)	2.63
Smiley (Sask.)	2.40
Pembina	2.61

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.0-16.4, Caripito	2.30
Lagunillas heavy, flat, Amuay or Las Piedras*	2.25
Bachaquero, flat, 15°-16°, Las Piedras*	2.05

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 35.0°-35.9°, Fao	1.98
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.49
Iraq, 36.0°-36.9°, Tripoli, Banias	2.49
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Carib.-U.S.N.H., clean (Scale—45%) (9s. 4d.)	$1.31
Carib.-U.S.N.H., dirty (USMC—60%)	1.08
★ Carib.-U.K., dirty (Scale—57.5%) (13s. 10d.)	1.94
P.G.-U.K., dirty (USMC—62.5%)	4.09

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2 WALKER-NEER SPUDDERS—Models C-34 & S-33. Complete drilling and completion tools—Robert Boyle, Okla. City, Okla.

20,000 FT. OF 1¼" EUE Seamless Well Tubing, T&C, 21 ft. R/L. Excellent condition. Price—30c foot F.O.B. our yard. M. KAPLAN & SON, INC., Monroe, Louisiana. Phone FAirfax 2-5112.

MUST SELL—28L and 36L Bucyrus Complete with Tools from 12" down. Box 1215, Tulsa 1, Oklahoma. Phone DI 3-9563.

1956 FAILING 1500. G-D pump, long mast, pipe and auxiliary equipment. 1955 I-R 600 Gyrotlo compressor truck mounted. Richard Travis, Box 1283, Phone CHapel 2-8331, Grand Junction, Colorado.

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1 36L BUCYRUS Spudder complete with 5 and 7 inch tailing in tools. Dog house, butane tank, junk rack and light plant. Rod and tubing tools and hand tools. Phone Office 144, Res. 614, Cleveland, Oklahoma.

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2—USED 36-L Bucyrus-Erie Spudders. One equipped with Gas-Gasoline Engine, one with Diesel. Also two used 145 GK Waukesha Engines. The Buckeye Supply Company, P. O. Box 1231, Zanesville, Ohio.

COMPLETE ROTARY RIGS

two to ten thousand feet. Terms available. Will lease with option to purchase. For price and location contact

Cardwell Investment Company, Inc.
G. D. DRYDEN—AM 5-2611
604 Petroleum Building
Wichita, Kansas

FOR SALE EQUIPMENT

BETHLEHEM TRIPLEX Plunger Pump, Model TP-3, excellent condition. Suitable for salt water disposal. Can handle 1000 barrels per day at 1000#. Dorset Company, 610 National Bank of Tulsa Building, Tulsa, LU 4-7769.

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FAILING—Rotary Rig—Capacity 2500 Ft. 2900 Ft. 2⅞ in. x 30 ft. drill pipe, top grade, with new tool joints. Gardner-Denver Pump 5 x 10 skid-mounted. 3—30 ft. drill collars. Hughes core barrel. This rig too large for our needs. Price $20,000. Would consider top grade 1500 ft. at actual value—balance—cash. Hobert Betz—Lane, Kansas—Phone 39.

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3—265 KW 50 CYCLE A.C. GENERATORS
1—292 KW 50 CYCLE A.C. GENERATOR

all manufactured by Electric Machinery Manufacturing Company. We acquired these generators while trading on various lots of equipment. The generators have been used for about two years and are in excellent condition. Engines are not included.

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12" x 27', 20 Tray, 450#
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18" x 23', 11 Tray, 200# T-316SS
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Valves: Steel & SS ½" through 6"
Furnaces: Petro-Chem, ½, ¾ mil. BTU-HR.

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Steel Tube: 1000, 900, 650, 500, 300, 300 sq. ft.
Adm. Tube: 2250, 2200, 1300, 900, 740, 625, 300 sq. ft.
S.S. Tube: 1228, 947, 570, 536, 380, 315, 250, 157 sq. ft.
4-6% Chr. Tube: 1000, 500 sq. ft.
Fin Tube: 73, 21, 11 sq. ft.

PUMPS

Hot-Oil: 324 gpm @ 4600'; 735 gpm @ 3100'; 400 gpm @ 2000'; 1270 gpm @ 406'.
Water: 10,500 gpm @ 135'

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Worth.: LTC-6, Gas Engine, 800 hp.
Penna.: 100 CFM @ 500#; 385 CFM @ 160#

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SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

WELL SERVICING Equipment—Wichtex C-60 and C-65 heavy duty double drum units mounted on tandem trucks, three Ford pickup trucks plus complete tools, lines and equipment. Priced to sell. Located Abilene, Texas. Phone OR 2-5734, Abilene, or ED 6-3788. Fort Worth.

THOUSAND POUND working pressure, low temperature Natural Gasoline Extraction plant. New 1950, built by Black, Sivalls & Bryson, capacity 10 MMCF. Will sell whole or in part. Contact Drew Cornell, Inc., P. O. Box 1267, Oil Center Station, Lafayette, Louisiana.

FOR SALE EQUIPMENT

HORIZONTAL ALUMINUM TANK, 20,000 gallons capacity, 9'x44'. Excellent. Refinery Materials Co., JA 3-2189, Box 14306, Houston 21, Texas.

GAS METERS FOR SALE: Westcott and Foxboro Orifice Meters and Controllers. George Milner, Box 124, Okmulgee, Oklahoma.

FOR SALE: Rotary Rig Complete with National T-20 Drawworks single powered by WAK Waukesha Engine. 87' Lee C. Moore Jackknife. 7¼"x14" Oilwell Pump single powered by LeRoi L-3000 V-12 engine. 4750' of good 4½" drill pipe. 10 Drill Collars and all necessary equipment to complete rig. Call or write Travis Drillers, Inc., P. O. Box 1097, Austin, Texas. Phone GR 7-7725 or GR 8-5044.

FOR SALE EQUIPMENT

WANT EQUIPMENT: Did you find the equipment you wish to purchase in this column? If not, use an "Equipment Wanted" classified advertisement to find it. It is available somewhere and Journal classified advertisements will find it. See box heading for classified rates or write The Oil Journal.

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Other Equipment & Supplies

TOWERS—PROPANE GAS—dual 20,000 gal./day, also 6' x 30'; 5' x 58'
AGITATORS—20' x 28'4" Cone Bottom (2)
SEPARATOR—Hardinge Classifier, Oil/Water.
REBOILERS—750 to 993 Sq. Ft. 125 to 350 PSI
CONDENSERS—331 to 1500 Sq. Ft. Steel/Adm.
TUBES—NEW—Seamless 4-6% Chrome 4" to 6⅝", 5⅝" to 1" Steel, Admir. & Alum.
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TANKS—300 to 18,000 gal.—500 to 80,000 Bbl. 6,500 gal. PROPANE—10,000 Bbl. HORTONSPHERE.
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REACTORS—6' x 42' 345 PSI @ 850° F.
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PRESSURE VESSELS—10' x 15'—4' x 5'—3' x 7'—2' x 6'—18" x 22'— 12" x 18'
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STEAM PUMPS—Simplex 4½ x 2¾ x 4 to 12 x 6 x 12
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COLUMNS—6' x 82', 5' x 24', 4'6" x 28', 3' x 23'6".
Motors, Transformers, Generators, Stacks, Instruments, Buildings, Ice Makers, etc.

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1500 HP—525 volts D.C.—600 R.P.M.—NEW—2-bearing continuous duty motors—manufactured by Westinghouse. In original crates. From Navy Destroyer Escort. SPECIFICATIONS: 2-bearing 1500 HP—525 volts DC—2270 amps—600 RPM—ambient temperature 40° C—class B insulation—2-bearing pedestal sleeve type—shunt wound—efficiency 94.23%. ONLY 6 AVAILABLE—BUY NOW AND SAVE. Suitable for steel mill drive—offshore oil rigs—rolling mill drive—dredge pump applications.

1200 KW GENERATORS

(2) Equal to new—manufactured by Allis-Chalmers. 1200 KW—525 volts D.C.—2290 amps—750 RPM—cooling self-ventilated—totally enclosed—separate excitation—continuous duty—class B insulation—Mfg. type M.H.C.—frog leg armature.

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SOUTHERN GEOPHYSICAL COMPANY, INC.,

REDLANDS HIGHWAY, ACROSS FROM REDLANDS SCHOOL, APPROXIMATELY 6 MILES WEST OF

GRAND JUNCTION, COLORADO

FRIDAY
APRIL 18, 1958
2:00 P. M.
M.S.T.

DRILL RIGS

Mayhew 1000 power flow all purpose chain pull down drill rig mounted on 1953 Ford F750 4x4 truck. Completely equipped. Includes Gardner-Denver 440 CFM air compressor; Wheatley 5x6 mud pump, 25' mast, 13' Kelly, 5¼" Rotary table opening.

Mayhew 1000 all purpose chain pull down drill rig mounted on 1953 F750 4x4 truck. Completely equipped. Includes Wheatley 5½x6 mud pump, 25' mast, 13' Kelly, 5¼" Rotary table opening.

Mayhew 1000 all purpose chain pull down drill rig mounted on 1951 Ford F-6 truck. Completely equipped. Includes Wheatley 5x6 mud pump, 25' mast, 13' kelly—5¼" Rotary table opening. Also Winterweiss primary & secondary dust sampler.

Mayhew 1000 all purpose chain pull down drill rig mounted on 1952 International L-182 truck. Completely equipped. Includes Gardner-Denver 4¼x6 mud pump, 25' mast, 18' Kelly, 5¼" Rotary table opening.

Mayhew 1000 all purpose chain pull down drill rig mounted on 1951 Ford F-6 truck. Completely equipped. Includes Wheatley 5x6 mud pump, 25' mast, 13' Kelly, Winterweiss primary & secondary dust sampler—5¼" Rotary table opening.

Mayhew 1000 all purpose chain pull down drill rig mounted on 1952 Ford F-6 truck. Completely equipped. Includes Gardner-Denver 4½x6 mud pump, 25' mast, 18' Kelly, Winterweiss primary & secondary dust sampler, 5¼" Rotary table opening.

Mayhew 1000 all purpose chain pull down drill rig mounted on 1951 Ford F-6 truck. Completely equipped. Includes Gardner-Denver 4½x6 mud pump, 25' mast, 18' Kelly, Winterweiss primary & secondary dust sampler, 5¼" Rotary table opening.

AIR COMPRESSORS

Chicago-Pneu. Model RO2-600 Diesel Rotary air comp. mounted on 1950 (Model 6500) 2 ton truck.

Chicago-Pneu. Model RO2-600 Diesel Rotary air comp. mounted on 1950 Ford F-6 truck.

Chicago-Pneu. Model R02-600 Diesel Rotary air comp. mounted on 1951 Chevrolet 2 ton truck.

Ingersoll-Rand Model DR600 Diesel Rotary air comp. on 1949 Ford F-7 truck.

Ingersoll-Rand DR315 Diesel Rotary air comp. on 1952 Ford F-6.

MISCELLANEOUS EQUIPMENT

Approx. 3000' of drill stem.
Welding equipment—arc & Oxy-acetylene.
Asstd. truck & rig parts.
Plus many other items too numerous to list.

INSPECTION:

Equipment may be inspected any time prior to sale.

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CASH—For used steel tanks any size and condition. Steel structures for dismantling, also pipe in the ground. 300 mile radius. Covington Machinery and Construction Co., Bowling Green, Ky.

HELP WANTED

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Company has opening for man experienced in Rock Bit design and use. Metallurgical experience desirable. Send information on age, education, experience and salary expected to:

GLOBE OIL TOOLS COMPANY
11630 Burke Street, Los Nietos, California

Land Man Wanted
By Independent Producer

Must have experience in both office and field work.

BOX K-633,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

RATE & ECONOMIC RESEARCH MAN NATURAL GAS

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BOX K-624,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

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Excellent opportunity for Chemical Engineer who is willing to assume responsibilities. Minimum of 5 years plant operating experience.

Work will be to assist with plant operations such as catalytic cracking, reforming, de-sulphurization, atmospheric and vacuum distillation, polymerization, asphalt, wax, etc.

Box K-634, The Oil and Gas Journal, Tulsa, Oklahoma.

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If you're inclined to work and can locate the reserves, we'll locate the salary. This is an exceptional opportunity for the right man.

Box K-621,

The Oil and Gas Journal,

Tulsa, Oklahoma.

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SALESMAN to sell established line of Oil Field Specialties in North Texas area. Replies confidential. Box K-619, The Oil and Gas Journal, Tulsa, Oklahoma.

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Box K-641, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATION WANTED

GEOLOGIST: 31, Single, 4½ years Petroleum experience. 2½ years subsurface in South Louisiana, 2 years well sitting Rocky Mountains, West Texas. Detailed personal history and references forwarded on request. Box K-642, The Oil and Gas Journal, Tulsa, Oklahoma.

JOB AS GASOLINE Plant Manager. Applicant former Field Superintendent and Oil Company executive. References from former associates. Box K-630, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST: Experienced supervision of office and field. Desires association with growing aggressive oil company. Sound ideas for better prospect evaluation. Box K-637, The Oil and Gas Journal, Tulsa, Oklahoma.

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MUD ENGINEER, married, 32, six years experience with top service organization. Thorough understanding of drilling problems and mud control. Some product development and evaluation. Will relocate. Box K-623, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, 31, single, 5 years experience with a major oil company, desires position with an independent. Box K-617, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—M.S., 32, Surface and subsurface experience. Presently in Development, Gulf Coast major; desire relocation U. S. or Europe. Box K-609, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST

Young (37), aggressive, explorationist seeks more responsible position with large or small independent. Broad background in surface, subsurface and geophysical coordination. Experience in Texas, California, Wyoming, Kentucky, and Alaska. B.A., M.S. If your company needs someone to originate, direct, and/or pursue a sound program of oil exploration, I am your man.

Box K-534, The Oil and Gas Journal, Tulsa, Oklahoma.

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OFFERING CHOICE ROYALTIES with large estimated reserves per dollar invested. A. S. Berry, 530 Wright Bldg., Tulsa, Okla.

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WILL CHECKERBOARD—Have 1000 acres in good producing territory Licking County, Ohio. Possibility of 3 pay zones to 3000 ft. including Clinton sand. No proration in Ohio. Box K-608, The Oil and Gas Journal, Tulsa, Oklahoma.

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OIL OPERATORS: No oil prorationing in this area. LAKE ERIE EXPLORATORY BLOCK, Ontario side. 130,000 acres. Economic area, good structural and stratigraphic possibilities. Drillable contract basis. Requires $110,000 property expenditure first year. Principals only. Box K-628, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL AND GAS LEASES FOR SALE
70,000 ACRES—ALASKA PENINSULA
Southwest of estimated billion barrel Richfield Swanson River field where $30,000,000.00 exploration and development under way. This acreage near Humble Bear Creek Prospect toward north end of Alaska Peninsula.
Box K-605, The Oil and Gas Journal, Tulsa, Oklahoma.

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LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that approximately 1277.23 acres of land in 10 parcels within the known geologic structures of the Iron Creek, Bolton Creek, East Mahoney Dome, and Hatfield Dome fields, in Carbon and Natrona Counties, Wyoming, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre through sealed bids on or before April 23, 1958, when bids will be opened. Details of the lease offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Craig A. Decker, Manager.

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EQUIPMENT MEN . . . in the news

Matzner Joins Catalysts And Chemicals, Inc. . .

as sales engineer, specializing in working with engineering contractors on the application of specialty catalysis to the process designs for new chemical and petrochemical plants. The announcement of O. R. Matzner's appointment was made by R. E. Reitmeier, president of C. & C. I.

Matzner started his engineering career with Joseph E. Seagram & Sons where he held various positions in production, development, research, and central engineering. Since then he has been associated with process plant engineering as a mechanical and process design engineer, and more recently as a catalyst sales engineer with the Girdler Co.

Girdler Process Equipment Division Appoints Seven . .

according to John E. Slaughter, Jr., president of the division of National Cylinder Gas Co.

Bruce D. Miller has been named vice president of manufacturing; Allen M. Bond, Jr., director of engineering and product development; and N. T. Joyner, general sales manager. Also appointed were Boyd R. Hopkins, Thermex sales manager; Lamar D. Roy, Votator sales manager; H. E. Huber, process plants sales manager; and E. T. Beck, sales manager for overseas operations. The appointment of Lyman L. Dawson, administrative vice president for the division, was previously announced.

Slaughter said the assignments are part of a realignment of the company under which the division becomes one of several operating units.

Miller has held various production assignments with the company and its predecessor firms for the past 37 years, including 15 years as chief engineer for Votator equipment production. Bond joined the company in 1946 and for the past 5 years has been in charge of its activities in the fats and oils processing field. Joyner has been with company since 1951 and has served for 4 years as manager of Votator overseas sales and service.

Houston Oilfield Material Co. Forms Subsidiary . .

in Venezuela known as Homco International, C. A. An office has been opened in Maracaibo, and complete office and warehouse facilities are being constructed at Las Morochas.

George O'Leary, president of Homco, stated that Homco International is now in operation in western Venezuela, with complete fishing tool, directional drilling, and electrical well services staffed by engineers. In the near future, a complete oil-field supply division will be added.

The officers and directors of the subsidiary are George O'Leary, president, D. B. Allison, vice president and general manager; and J. E. Peters, secretary-treasurer. A. F. Coleman, operations manager is stationed in Maracaibo.

Shand & Jurs Co. Launches $500,000 Program . .

to develop remote supervisory control systems for the petroleum and chemical process industries. The program will begin immediately, according to R. M. Young, president, and will continue over a 2-year period. It will be administered by the company's electrical products division.

Young said the primary purpose of the new program is to develop fully-integrated systems for the sensing, telemetering, and recording of data for tank farms and other petroleum chemical facilities. He explained that the research and development program will be carried out at Shand & Jurs' research laboratories in Berkeley, Calif. The company recently expanded its plant facilities, adding new administrative offices and nearly tripling its production space.

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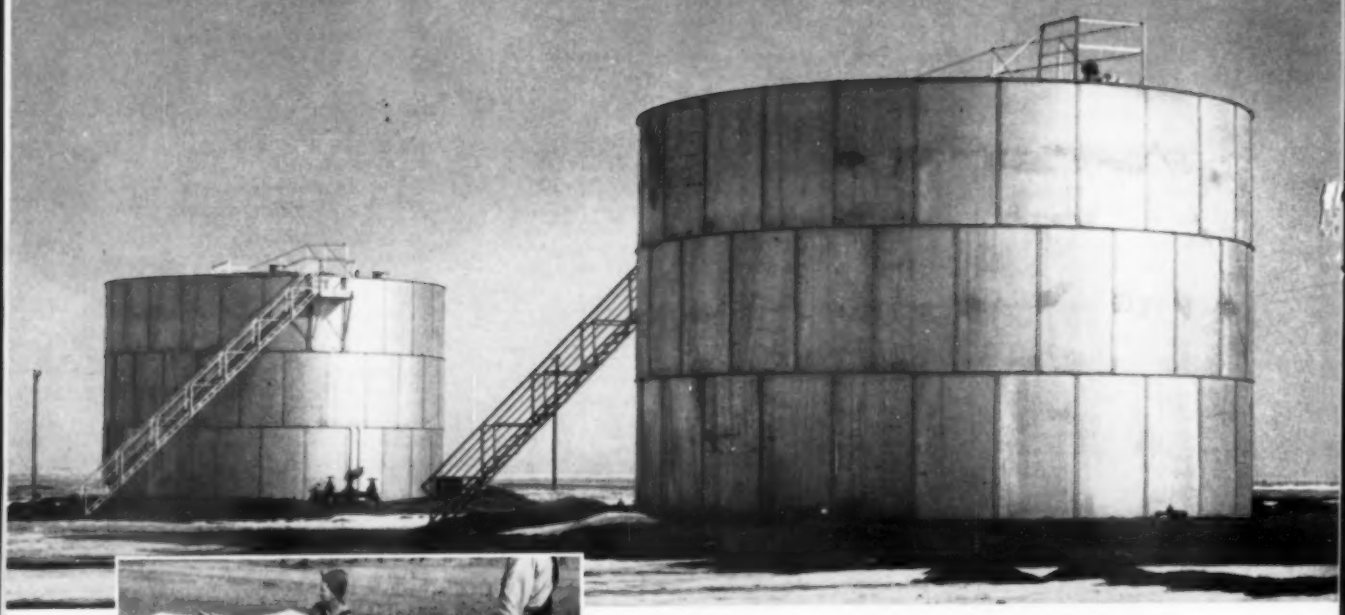

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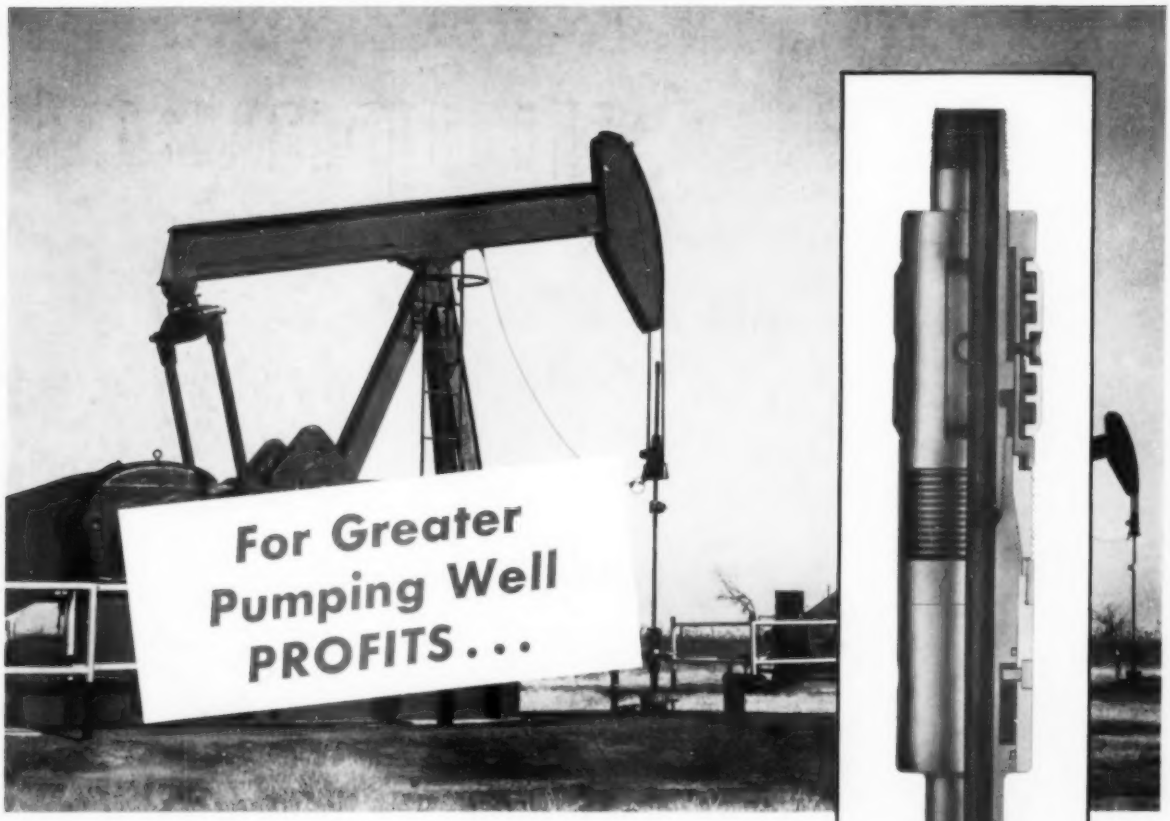

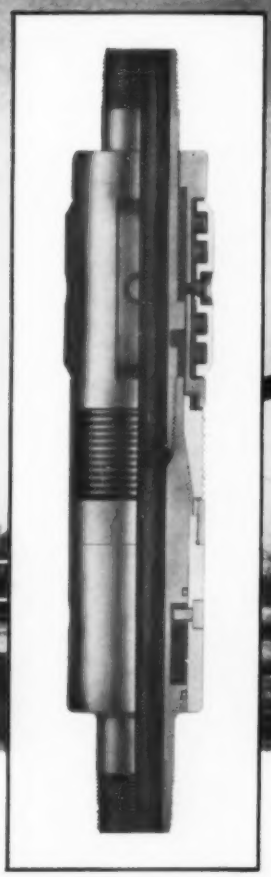

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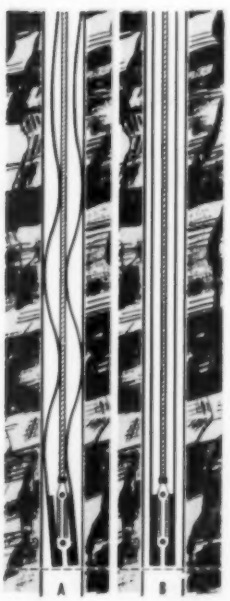

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